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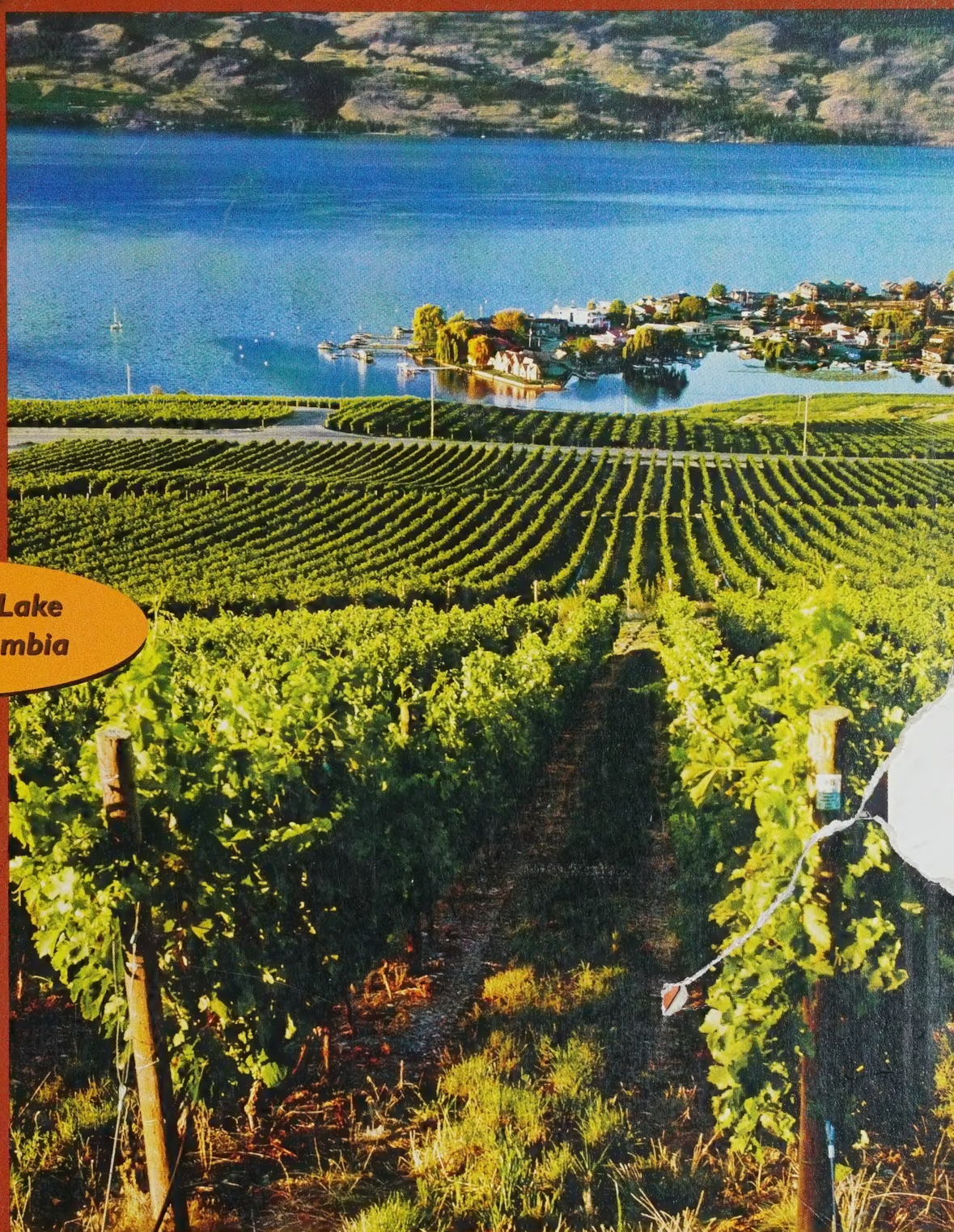
& VINEYARD
NOVEMBER/DECEMBER 2007

Cleaning/disinfection—
of oak barrels/adjuncts

MICRO-OXYGENATION
Theory/Applications
Innovative winemaking



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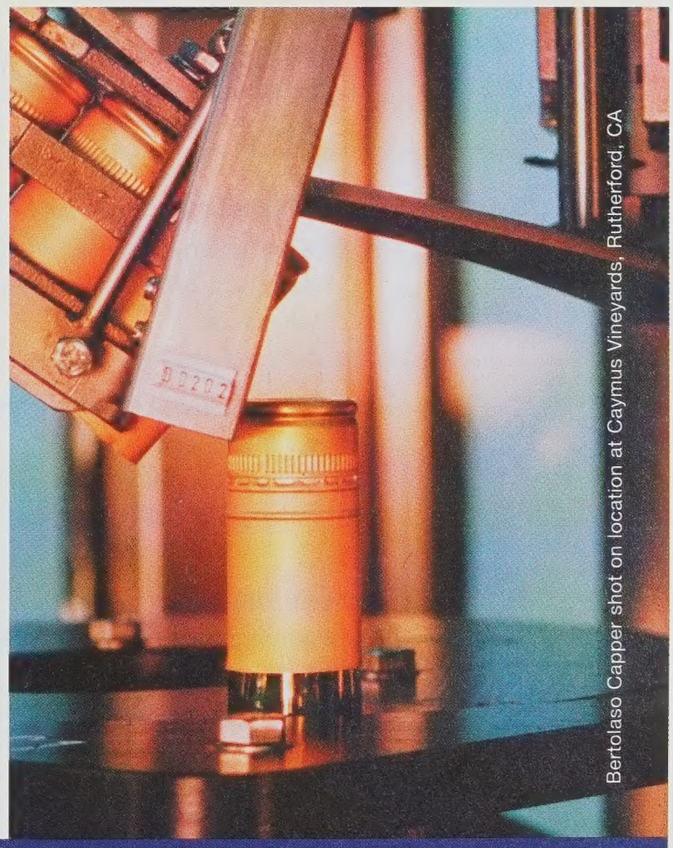

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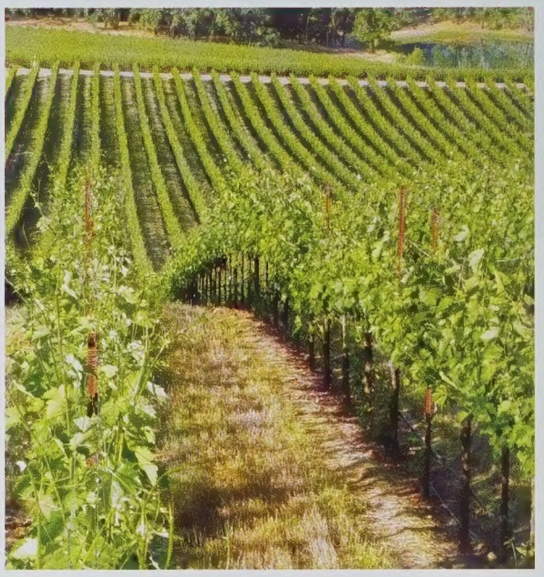

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Cleaning/disinfection of oak barrels/oak adjuncts with high-power ultrasonics

BY Andrew Yap,[1*] Vladimir Jiranek,[2] Terry Lee,[3] Paul Grbin,[2] Mark Barnes,[4] and Darren Bates[1]

Oak barrels are an essential component of a winery's inventory. The main use of barrels is for red wine maturation, which may occur over eight to 24 months — in some cases longer.

It is estimated that several million barrels are currently in use in wineries throughout the world.

Winemakers have the following major concerns about barrels: in-barrel spoilage, volume loss through evaporation, short barrel life, and renewal/maintenance costs.

Tartrate buildup, both on the internal surfaces of the barrel and in the pores of the staves, shortens barrel life, thus increasing the replacement costs and premature "write-down" of barrels.

Large wine companies spend millions of dollars on barrel replacement, and therefore search for ways to reduce this annual capital expenditure.

According to the December 2005 *Oak Flavours and Tannins Suppliers Workshop Report* (Anon, 2005), expenditure on oak products, after grapes, is the greatest cost element in wine production. G. Baldwin and R. Paul estimated that the cost of a liter of wine matured in a new French oak barrique ranges from A$1.22 to $1.33 per liter if the wine is held for one year and the barrel is used four years.[6]

In-barrel spoilage generally results in financial loss, such as when an icon-quality wine infected with *Brettanomyces/Dekkera* has to be blended with a lesser quality wine to dilute the by-products of microbial metabolism and then is sold on the market at a much lower price-point. In some instances, badly-tainted wines have to be disposed of. Financial loss at this stage is substantial because the wine has already undergone almost 75% of its processing.

Figure I. Consecutive staves from a section of a 6-year-old barrique used since 2001 for white wine fermentation. Each vintage, juice was fermented in the barrel, the wine racked once and the barrel given a quick cleaning to remove lees. Wine was then returned for maturation. As the wine usually contains some sugar (2 to 3 g/L) because of style requirements, sulfite addition to the wine was essential to prevent re-fermentation due to presence of viable yeast cells in the interior surface of the barrel and wood pores. Note the unevenness in distribution of solid residue (tartrates, yeast lees, etc.) among the staves, reflecting uneven distribution of high pressure water impacting upon the staves. Staves 4, 5, and 6 were entirely covered with solid residues. Stave 4 was heavily coated with thick (3 to 10 mm) residues, while the residues in Staves 5 and 6 were 1 to 3 mm thick. Staves 1 and 2 were sparsely coated with residues, with some thick deposits. At least 80% of the surface of Stave 3 contained solid particles embedded in the fissures and cracks in the wood surface.

It is not surprising, therefore, that the control of microbiological contamination during barrel maturation, and the spoilage yeast *Brettanomyces/Dekkera* per se, were ranked fourth and eighth, respectively, out of the top 25 enological issues identified in the 2006 national research and extension priorities list for the U.S. winegrape industry.[2]

High-power ultrasonics (HPU) is a new and powerful technology that has been exploited in several food and beverage processes. We evaluated its likely benefits in winemaking, initially surveying the effectiveness of current barrel cleaning systems. As a result of the survey, the efficacy of HPU was assessed in removing tartrates and solid residues from used barrels, in removing tartrates and solid residues from oak alternatives (planks and staves), and in killing *Brettanomyces/Dekkera* cells.

This paper provides evidence that HPU is an effective tool for cleaning

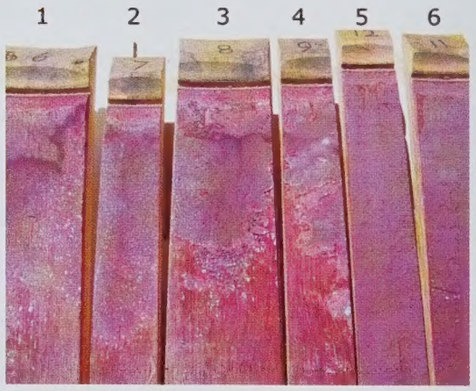

Figure II. Consecutive staves from a section of a 6-year-old barrique used since 2001 for red wine maturation. Barrel was cleaned with a low and high pressure (up to 3000 psi/ 20,000 kPa) cold and hot water barrel washing system about four times per year since 2001. Tartrates were removed from less than 10% of the surfaces of Staves 1–4 for each of the staves (note: unseen portions of each stave) were completely covered with tartrates. Thickness of deposits varied from 1 to 5 mm. Tartrate deposits present on Staves 5 and 6 were flat (< 2 mm thick), hard and difficult to remove even by scraping with a knife.

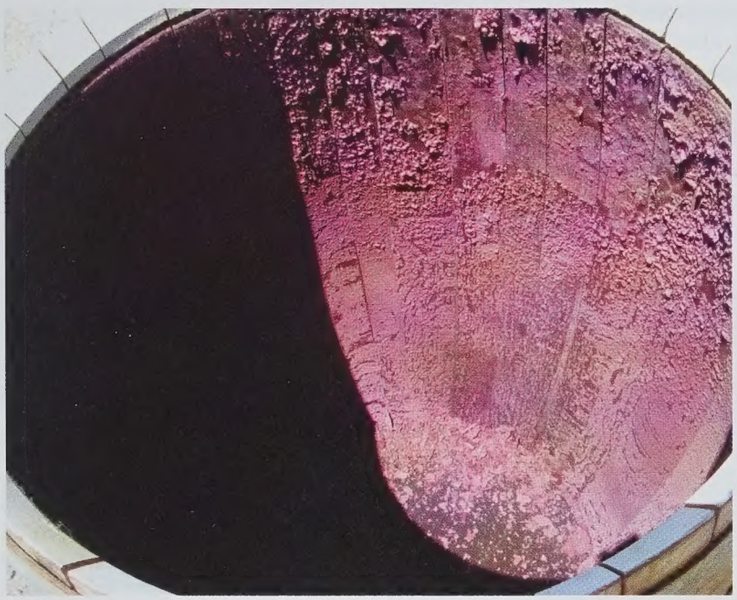

Figure III. A 3-year-old barrel which was cleaned with town-supply water pressure cold water applied through a large hose with a spray ball. The hard and flaky tartrate deposit overlaid a soft deposit below. Note heavy deposit in the croze. This barrel was designated by winery staff to be ready for filling with new wine.

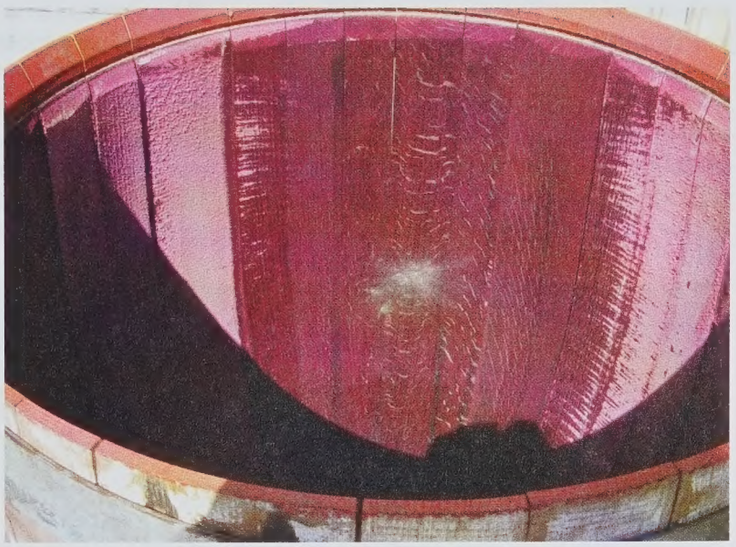

Figure IV. A 1-year-old barrel which was cleaned with high pressure cold and hot (65°C) water from an advanced automated barrel cleaning system with a spray head inserted through bung hole. The bottom seven staves appeared relatively clean (about 5% residues remaining) while the remaining staves contained 99% tartrate deposits (1 to 3 mm thick in a corrugated pattern). This barrel was designated by winery staff to be ready for filling with new wine.

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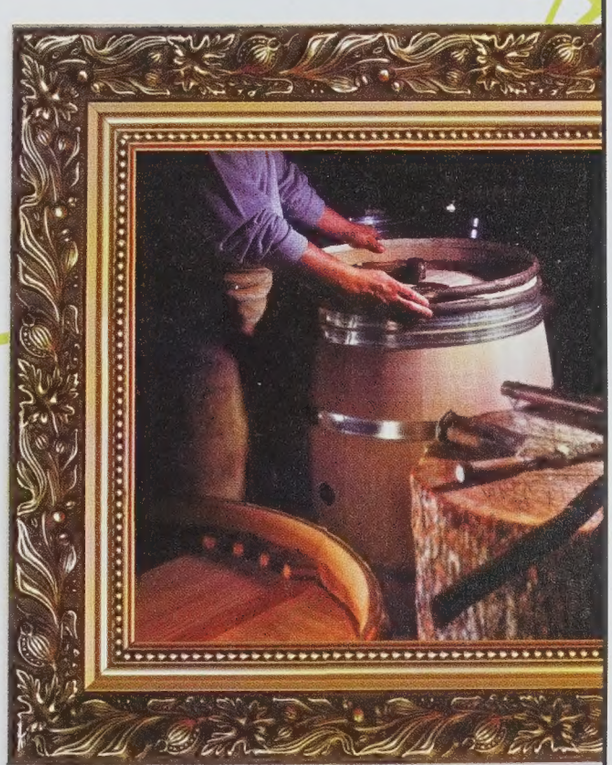

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oak barrels and oak inserts (planks and staves), and for killing viable *Brettanomyces/Dekkera* yeast cells. The paper also highlights the advantages of HPU over current methods and the benefits it will bring to the wine industry.

Microorganisms associated with wine barrels

The range of microorganisms that are well-adapted to wine conditions and inhabit the interior of wine barrels has been reviewed.[9,10,15,34] Bacteria and yeasts are protected behind tartrate deposits and in the pores of the wood, where they act as seed organisms for the infection of new wine.

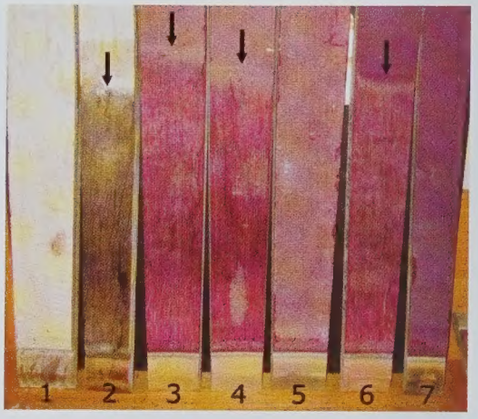

Figure V. Staves 1 and 2 were obtained from a 6-year-old barrique that had been in constant use since 2001 for white wine fermentation. At each vintage, juice was fermented in the barrel, the wine racked once and the barrel was quickly cleaned with a barrel washer to remove lees. Both staves were entirely covered with thick (2 to 3 mm) and hard solid residues (tartrates, yeast lees, etc.). The bottom half (below the arrow) of Stave-2 was treated ultrasonically for five minutes. Note the complete absence of tartrate and yeast lees. Staves 3–7 were obtained from a 6-year-old barrique that had been used since 2001 for red wine maturation. The barrel had been cleaned with a low pressure cold and hot water barrel washing system annually between 2001 and 2004, and with a high pressure (3000 psi / 20,000 kPa) hot and cold water cleaning system in 2005 and 2006. The barrel was cleaned about four times per year and was last cleaned December 2006. It was dismantled for the trial in February 2007. The bottom halves (below the arrows) of Staves 4, 3, and 6 were treated ultrasonically for 3, 7, and 10 minutes, respectively. Staves 5 and 7 were untreated. Note the complete removal of tartrates and considerable reduction of color pigments (Stave 7) in the portion of Stave 6 below the arrow. Tartrate deposits on the untreated staves were hard, with thickness ranging from 2 to 4 mm.

Barrels infected with acetic acid bacteria or molds are normally discarded, as the organisms and their metabolites are difficult to remove from the pores of the wood. The growth of different genera and species of yeasts and bacteria is controlled by winemaking practices, such as pH adjustment, "topping up," and sulfur dioxide and dimethyl dicarbonate (DMDC) additions.

Biofilms form when a liquid is in contact with an inert surface and any microbial cells within the liquid

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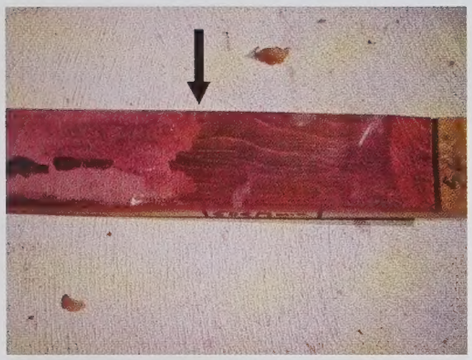

Figure VI. Stave from a 7-year-old Brett-infected hogshead. The barrel had been cleaned with a high pressure cold and hot water cleaning system every year. The above stave was covered with a hard tartrate deposit ranging in thickness from 1 to 3 mm. The part of the stave on the right hand side of the arrow was treated with HPU for five minutes. Note the complete absence of tartrate deposits on the treated surface and croze.

become attracted to the surface and adhere to it.[1] As biofilms are found on the stainless steel surfaces of food processing equipment and wine tanks, winery microorganisms can be expected to form biofilms on surfaces and in the pores of oak barrels.[36]

In a study of 35 isolates of *Brettanomyces/Dekkera* from the yeast culture collections at UC Davis and Cornell University in Geneva, NY, C.M.L. Joseph and L. Bisson found that 50% of the strains formed biofilms.[19] Biofilms can slough off into the environment at the liquid-solid interface.

G.G. Kumar and S.K. Anand reported that biofilms are 1000 times more resistant to biocides, chemical cleaning agents, and sanitizers.[20] In some cases, antibiotic resistance can also be increased 1000-fold.[22]

Biofilm formation in barrels and their effects on wood structure and other consequences are largely uncharacterized. The effectiveness of a cleaning method can be determined by its ability to break down biofilms. Ultrasound provides an efficient method of stressing cells and detaching them from solid surfaces.

F. Lefebvre et al. detached human osteoblast cells that had adhered to the surface of a culture flask using ultrasound at approximately 190 kHz.[21] In the food and pharmaceutical indus-

Figure VII. A pile of discarded planks in a 'wood graveyard.' All planks were covered with heavy deposits of tartrate (2 to 10 mm thick), some with noticeable mold growth.

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tries, HPU is currently used to remove biofilms from the surfaces of equipment and stainless steel lines (Bates, pers. comm.).

The spoilage yeast *Brettanomyces/Dekkera* is widespread in winemaking regions. A considerable volume of literature describing the distribution and impact of *Brettanomyces/Dekkera* on wine quality and methods for its detection and control is available (including T. Arvik and T. Henick-Kling;[5] A. Coulter et al.;[11] C.D. Curtin et al.;[12] L. Van de Water[31]).

The incidence of spoilage by *Brettanomyces/Dekkera* has increased dramatically over the last 30 years, largely due to the following:

1. improper/inadequate cleaning and disinfection of barrels — a critical source of *Brettanomyces/Dekkera* infection of wine;
2. infected barrels traded in the second-hand market — one of the major reasons for the spread of *Brettanomyces/Dekkera* between wineries and regions;
3. recent trends in some winemaking styles and practices, such as wines with higher pH and residual sugar, and the decreased use of filtration and SO_2 — all of which are conducive to the proliferation of *Brettanomyces/ Dekkera;* and
4. importation of Brett-infected wine from an affected winery.

Some spoilage microorganisms — such as *Lactobacillus* species, which form chains of cells; *Brettanomyces/ Dekkera* species, which form pseudomycelia; and molds, which form extensive mycelia — penetrate the pores of the wood during growth and reproduction. Since wine penetrates as far as 8 mm into the wood,[24] it is expected that spoilage microorganisms would be found at such depths of the stave where the wine has traveled.

C.H. Swaffield and J.A. Scott showed that a variety of microorgan-

Figure VIII. The planks, harvested from a tank of maturing red wine, had been kept dry at ambient temperature for about two weeks prior to the test. Tartrate deposits in the uncleaned portions of the planks (above the hole) were almost dry and ranged in thickness from 1 to 3 mm. Sections of the planks below the holes had been treated ultrasonically for five minutes. Nearly (>99%) all tartrate deposits were removed from the surfaces.

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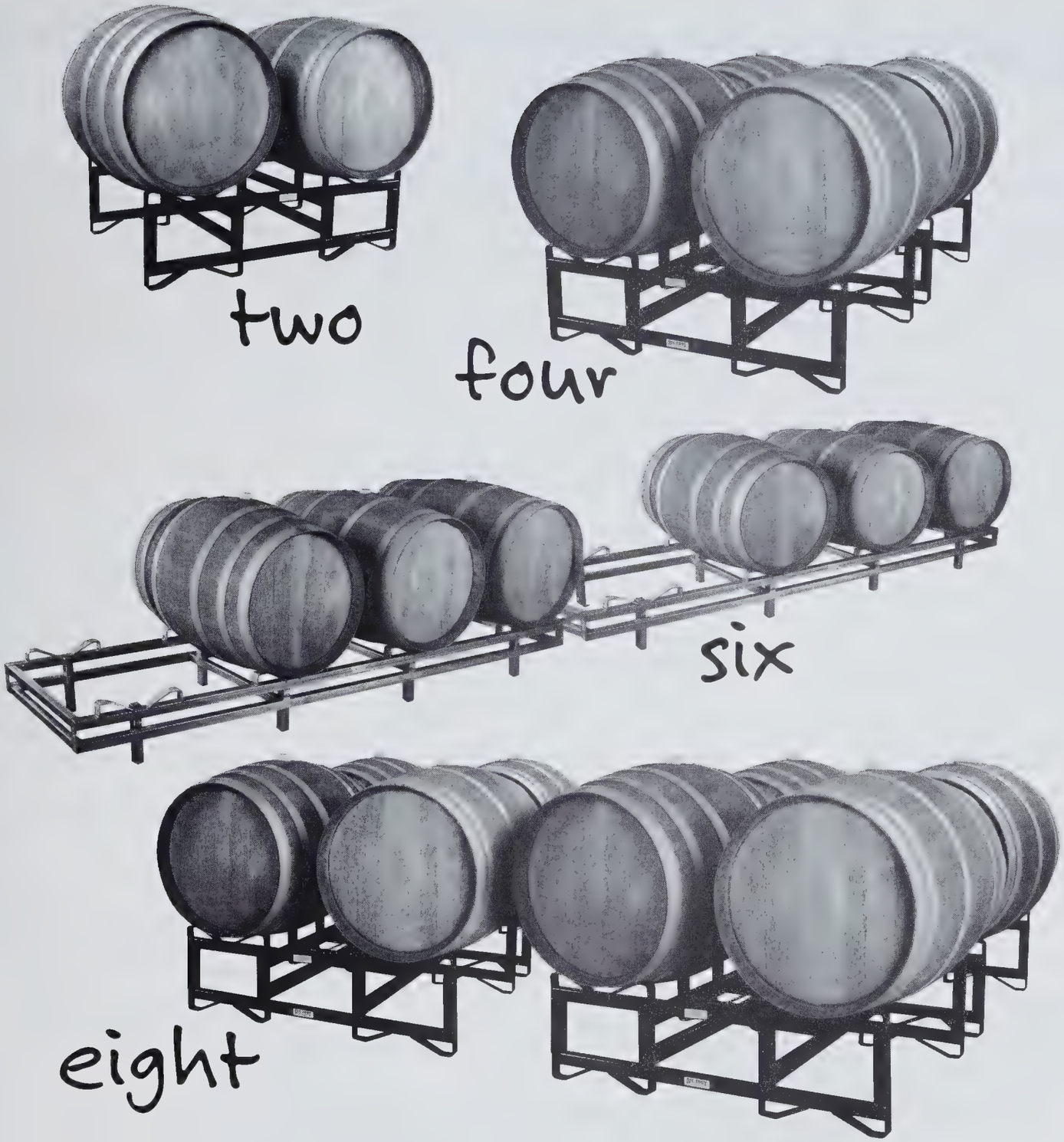

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isms were capable of establishing populations in the porous structures of wooden cider vats,[28] which persisted after emptying, cleaning, and refilling cycles. They reported that microorganisms were capable of penetrating to a depth of 12 mm in new wood within two weeks.[29]

Unicellular or filamentous structures and biofilms embedded in pores are difficult to inactivate or remove. Over time, several microbial types become permanent residents in the wood if they are not dislodged or inactivated.

Barrel sanitation

Storage of wines, which are naturally high in tartrates, in oak barrels inevitably results in the progressive coating of the barrel interior with tartrate precipitates. This insoluble layer can build up to a thickness approaching 1 cm, depending on the wine and barrel cleaning program. Such tartrate coatings are undesirable because they block the extraction of oak flavor compounds into the wine, they can alter wine maturation rates by reducing oxygen permeation through the wood and into the wine, and they may harbor and protect spoilage organisms.

Studies by N. Vivas and Glories (1993) and Moutounet et al. (1994), as cited in Anon (1996), found that the dissolved oxygen content in new barrels varied from 0.3 to 0.5 mg/L (with a corresponding oxidation-reduction potential of 250 to 350 mV). The prolonged utilization of barrels resulted in the progressive blocking of the pores and a simultaneous decrease in the dissolved oxygen and oxidation-reduction potential. After three to five fills, the conditions in the barrels approximated those in tanks (dissolved oxygen less than 0.1 mg/L and oxidation-reduction potential less than 200 mV).

Since development of red wine in a barrel is dependent on the slow ingress of oxygen from the outside of the barrel into the wine through the staves, the clogged pores limit the length of time the barrel would remain useful for the purposes of wine maturation and oak flavor extraction.[32]

Over the last 35 years, the evolution of precision winemaking tools and refinement of winemaking practices have resulted in production of the better quality wines that are available today. In contrast, methods and technologies for barrel cleaning have changed little.

Current descaling treatments for barrels that typically use hot water and chemicals are ineffective, as evidenced by the rampant spread of the spoilage yeast *Brettanomyces/Dekkera* in all wine-producing countries. Currently, most efforts related to this problem are focused on finding methods for detecting the organism rather than at looking at ways to abate the spread.

Various winemaking practices have been suggested to reduce *Brettano-*

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myces/Dekkera populations in barreled wines and to ensure their absence in wine prior to bottling.[11,25]

Methods that are currently available to remove tartrates and solid residues and disinfect barrels have been reviewed by Yap et al. (2007b). Our survey showed that hot water ranging from 60°C to 82°C is commonly used in conjunction with high pressure cold/ hot water systems; the most common temperature being 65°C. Such temperatures may dissolve soft tartrates, but hard tartrates generally require a temperature beyond 85°C or steaming. Unless wood surfaces are completely devoid of tartrates and other solid residues, the above temperatures may only provide nominal disinfection.

In an evaluation of sanitation procedure, using Brett-infected barrels, M. Malfeito-Ferreira et al. found that only steam was able to decontaminate the interior stave surface and even then only up to the first 2 mm below the wood surface.[24]

Various cleaning chemicals, including solutions of caustic soda and sodium and potassium carbonate, may be used to dissolve tartrates. Some proprietary chemicals are required to be held in barrel for 24 to 48 hours for them to work effectively. Chemicals often have to be used carefully and in sequence, not only to guarantee barrel cleanliness but also to ensure they do not taint the wines.

A common antimicrobial agent that is added to barrels following cleaning is sulfur dioxide. *Brettanomyces/Dekkera* yeasts are sensitive to molecular sulfur dioxide at a concentration of 0.8 mg/L when suspended within the body of the wine; however, their presence in the cracks and crevices of staves protects them from the biocide.[15] Sulfur dioxide at even substantially higher concentrations may be ineffective in controlling the sequestered populations.

Although ozone is effective in treating water and wastewater, and inactivating bacteria present on stainless steel surfaces, its use in decontaminating barrel surfaces has been limited. In New Zealand and California, where ozone is widely used, some winemakers believe that ozone can control *Brettanomyces/Dekkera* populations in their cellar, while others are ambivalent.

In the absence of rigorous research, only anecdotal evidence currently suggests that ozone is effective in barrel sanitation. Precipitated tartrates and other solid residues present an impervious barrier to ozone and sulfur dioxide. Pre-cleaning of the barrel prior to ozone application therefore plays an important role in determining ozone efficacy.

Wineries without the equipment to effectively remove all tartrate deposits from the interior surface before the introduction of ozone may not gain the maximum benefit from the ozone.

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A more traditional approach for removing recalcitrant tartrate deposits and microbial populations involves shaving the interior surface of a used barrel. Most barrels are shaved 1 mm to 3 mm each time when they are one to four years of age. There is no guarantee, however, that the remaining oak will be free of microorganisms, since they can penetrate wood to the same depth that the wine has traveled.[24]

A.P. Pollnitz et al. found that wine stored in shaved and retoasted Brett-infected barrels contained 4-ethylphenol and 4-ethylguaiacol, confirming the presence of viable *Brettanomyces/Dekkera* cells in the wood.[27]

Shaving and firing has been tried by almost all winemakers, and rejected by many as being counter-productive.[18] Some wineries do not shave barrels but sell them on the second-hand market after two to four years. This practice has spawned a large second-hand market for used (Brett- and non-Brett-infected) barrels worldwide.

Due to the way an oak barrel is constructed and its shape, it is difficult for current technology to effectively clean and disinfect its interior surface. According to R. Boulton et al., barrels are difficult to clean and often impossible to sterilize once they have become contaminated with spoilage microorganisms.[8]

Given that *Brettanomyces/Dekkera* can be found penetrating the wood to the same degree as the wine itself, there appears to be no treatment capable of effectively decontaminating infected barrels, at least not without significantly impacting the barrel properties or serviceable lifespan. To date, it has been generally agreed by leading researchers that infected barrels cannot be sterilized effectively by hot water, steam, ozone, sulfited water, sulfur dioxide gas, or shaving and toasting.[5,24,27] T. Arvik and T. Henick-Kling also state that the presence of *Brettanomyces/Dekkera* can only be monitored, but not controlled.[5]

Application of HPU to food and beverage processing

The mechanism of ultrasound action, its successful application to a range of processes in the food and beverage industry, and the opportunities for its application to wine processing have been recently reviewed.[33]

Ultrasound with frequencies higher than the range audible to humans (16 to 20 kHz) is generated from electrical energy. Power ultrasound (16 to 100 kHz) achieves its chemical or mechanical effects by generating high-energy micro-bubbles within a liquid/slurry reaction medium that subsequently collapse — a process known as cavitation.

Collapsing bubbles created by high-power ultrasound generate a localized temperature of up to and greater than

5000°K (4727°C) and pressures of up to 203 MPa (2000 atm). At the point of collapse, the unstable bubbles release energy that causes shock waves, acoustic streaming, and vibration. Typically, the high-shear energy wave that results in the liquid medium and at the surface of solid boundaries can travel at up to 570 km/h.

Shock waves that transfer kinetic energy have many applications, including improved cleaning of organic/inorganic surfaces and porous interior structures; killing of microorganisms on surfaces, in liquids, and in porous interior structures; reducing particle size and variability in liquid suspensions; and accelerating fermentation.

Acoustic streaming, which transfers heat and mass, has applications in enhancing extraction of color/flavor/nutrient/by-product components and in decreasing undesirable pasteurization effects on the product. Vibrations, which reduce surface friction, have several applications, including: preventing undesirable matter from adhering to equipment and membrane filters, improving product compaction, and degassing.

Academic and select applied industrial research over the last 30 years has shown that HPU offers numerous performance advantages over conventional technologies for liquid-phase, food-grade processing applications, such as enzyme activation/inactivation, reduction of negative effects on pasteurized products, and extraction of important compounds from organic materials. Furthermore, HPU can have beneficial effects on product viscosity, stabilization, consistency, disinfection, and homogenization/emulsification, and on cleaning and disinfection of equipment.

In cleaning applications, HPU disintegrates solids and removes layers of solid material or dirt from surfaces. Economic advantages of the application of HPU include low maintenance, ease of use, low energy input costs, limited thermal input, reduced need for chemical catalysts and solvents, yield improvements (such as reduced waste), and throughput/efficiency gains.

Ultrasound has been applied to the disinfection of a wide variety of microbes including yeasts,[7,17,30] bacteria,[13,14,16,26] and various fungi.[23,35] The effectiveness of HPU for cleaning and inactivating vegetative microbial cells and spores has recently been reviewed.[34]

Barrel cleanliness studies

Over a three-year period, Cavitus Pty Ltd examined more than 130 barrels that were selected randomly from large, medium, and small wineries. All barrels had previously been cleaned with high pressure cold and/or hot water and were ready for refilling with new wine.

In one study, however, Cavitus examined barrels from a small winery that had been cleaned only with normal pressure cold water from the town supply (about 174 psi/1200 kPa).

In a large study, one- to five-year-old barrels that had been cleaned by the most advanced high pressure cold and hot barrel washing system were examined.

In all studies, one head-stave of each barrel was removed by coopers and the interior surfaces of the staves and head-staves were visually examined and photographed.

The findings of these studies are summarized below:

1. Tartrate deposits differed in appearance. The elevation of deposits ranged from flat (up to 1 mm thick) to raised (up to 3 mm) and blister-like (up to 1 cm).
2. The texture of the tartrate residues ranged from soft to very hard, and the appearance from fine crystalline particles to thick powdery coatings and large flaky elements.
3. Some tartrate deposits, in particular the flat ones (1 mm to 2 mm thick) bound strongly to the wood surface and did not peel off when they were in a dry state.

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4. Tartrate deposits were present, not only on the surface of staves, but also in the grooves or croze of the staves in which the head-staves are set.
5. The amount of tartrate deposit present in the "cleaned" barrels, as determined by the coverage on the wood surfaces, showed a positive correlation between the extent of coverage and the age of the barrel. The coverage ranged from about 10% of the total surface of the cleanest barrel (predominately one- and two-year-old barrels) to essentially 100% for older barrels (predominately five years or older). Tartrate deposits in older barrels are often thicker, and more extensive.
6. There was inconsistent and uneven distribution of the washing effect inside barrels. As a result, tartrate deposits were incompletely removed from staves (Figures I, II, IV). As noted above, older barrels have a high proportion of their surfaces covered with tartrate deposits.
7. None of the cleaning systems were able to remove all tartrate deposits from the croze.
8. The area covered by tartrate deposits on head-staves ranged from 10% to 100%.
9. Cold and hot water removed only surface deposits and generally rather poorly, leaving tartrates embedded in the pores, fissures, and blisters of the wood. The presence of impregnated deposits was evident even with the use of an advanced, automated high pressure cold or hot water barrel washer.
10. Normal town-supply water pressure was completely ineffective in removing tartrates (Figure III).
11. Most staves that appeared relatively clean still contained impregnated, fine powdery tartrate deposits on the wood surface where the pores and fine fissures exist.

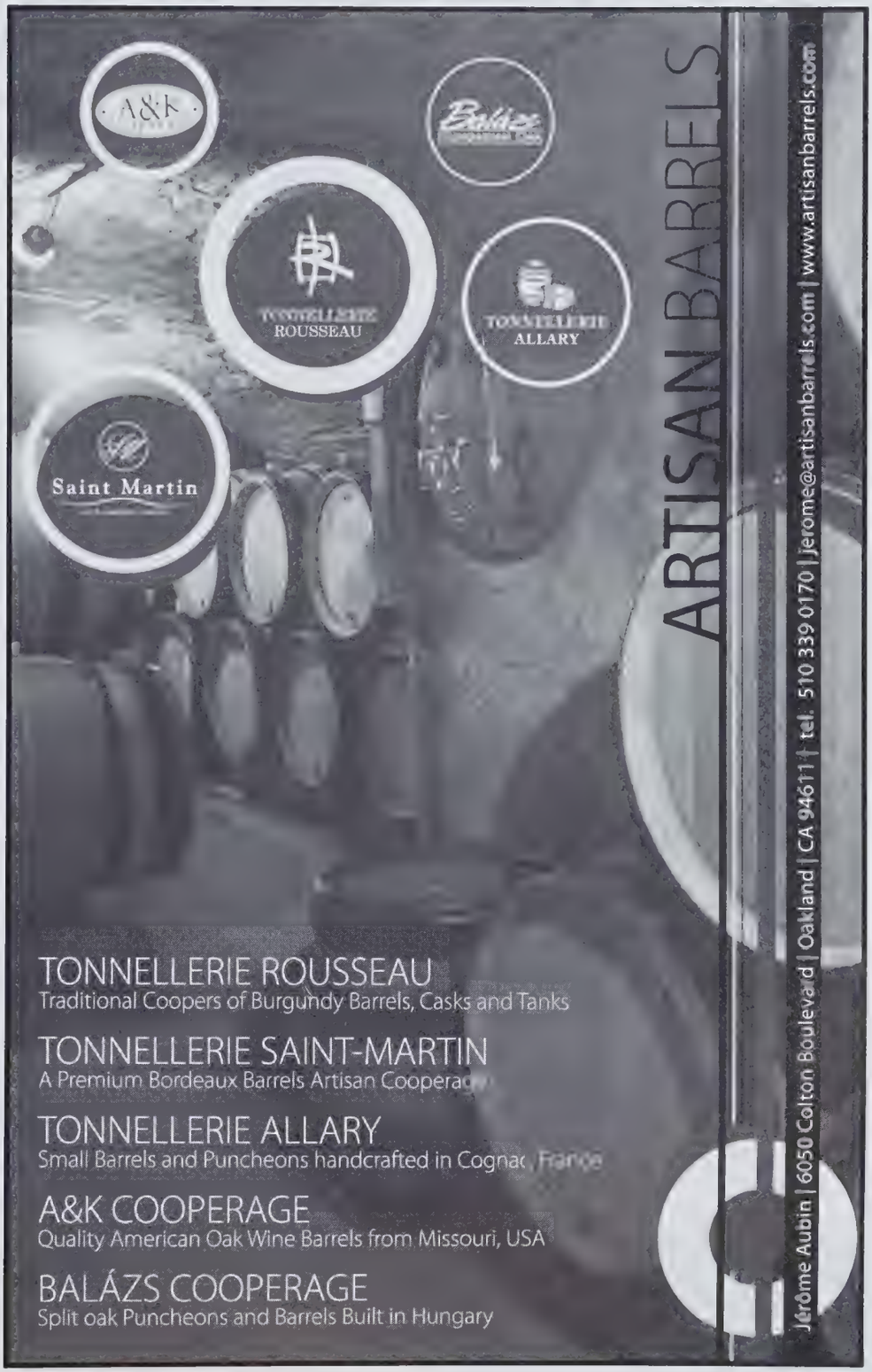
It is therefore clear that existing barrel cleaning methods are inefficient at complete removal of tartrate deposits.

Efficacy of HPU for cleaning the interior surface of barrels

A preliminary trial to determine the barrel-cleaning efficacy of HPU was done with a five-year-old hogshead (300 L) and with staves obtained from recently cleaned barrels of different ages.

Approximately 50% of the hogshead was filled with water, and ultrasound was introduced into the water via the sonotrode of an HPU unit. Prior to treatment, more than 90% of the interior surface of the barrel was covered with a hard tartrate deposit. Sonication for about 10 minutes effectively removed all tartrates from the surface of the treated section of the barrel.

In the trials with staves from recently cleaned barrels, one or more of the staves were partly immersed in water and sonicated for periods rang-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ing from 3 to 10 minutes with a 1 kW unit. The ability of HPU to remove tartrate deposits from staves of six- and seven-year-old barrels is shown in Figures V and VI.

Efficacy of HPU to clean barrel inserts — tank planks, staves

Planks of various lengths (up to 2 meters) and staves (0.9 to 1.2 meters in length) retrieved from tanks containing young red wines after three months are often covered with tartrates up to 1 cm thick. One can surmise that the usefulness of inserts is limited after that time. Some wineries employ the same inserts for up to four fills with cleaning between fills. Other wineries discard them after one extended use (6 to 12 months).

Currently there is no standard method for cleaning inserts. Several wineries clean inserts either *in situ* or after removal from the tank with high pressure cold water. *In situ* cleaning is generally inadequate as considerable amounts of tartrate are still present on the surfaces. High pressure water also damages the wood surfaces and exposes raw wood to the wine.

More trials were carried out over a two-year period with planks and staves sourced from two large wineries. Freshly harvested inserts (from red fermentation tanks), discarded planks retrieved from a "wood graveyard" (Figure VII), and those stored in a shed for up to one year were sonicated with either a 400 W or 1 kW unit. Tartrates from freshly or recently harvested inserts were easily removed with a few minutes of sonication, revealing the fresh and clean aroma of oak (Figure VIII).

Efficacy of HPU at killing Brettanomyces/Dekkera bruxellensis *cells*

Two laboratory studies have shown that ultrasound can be applied successfully to kill viable *Brettanomyces/Dekkera bruxellensis* yeast cells.

The preliminary trial was undertaken with a 50W HPU unit with the power control set at values ranging from 20% to 100%. An active culture of *Brettanomyces/Dekkera bruxellensis* strain was obtained by inoculating the organism into YEPD broth (yeast extract, 10 g/L; peptone, 20 g/L; glucose, 20 g/L), followed by incubation for five days at 28°C. A known volume of the culture was added to 30 mL sterile saline to give 4.4×10^6 cells/mL.

Ultrasound was applied via a sanitized (70% alcohol for five minutes) sonotrode to the suspensions at 22°C at three power densities. After serial dilutions, the treated samples were plated in duplicate onto YEPD agar and incubated at 28°C for up to five days.

The kill rate using ultrasound power from 10 to 50 watts ranged from 88.0% to 99.9%. Ultrasound power at 50 watts for 90 and 120 seconds killed 97.0% and 99.9% of the cells, respectively. Such results are highly promising given that the initial number of viable cells used in the study, i.e. 4.4×10^6/mL, is high and unlikely to occur in maturing red wines stored in oak barrels.

Following the preliminary trial, a second trial was undertaken with a culture of *Brettanomyces/Dekkera bruxellensis* strain CBS2336 prepared by growth in YEPD agar (yeast extract, 10 g/L; peptone, 20 g/L; glucose, 20 g/L) for four days at 28°C. The cells were harvested aseptically by centrifugation and resuspended in 4 L of sterile saline, preheated to 40°C or 50°C, at 1×10^6 cells/mL to commence each experiment.

The sanitized sonotrode (70% ethanol for five minutes) of a 1 kW HPU unit was introduced into the suspension and the unit turned on. Culture samples were collected after five- and seven-minute exposure to ultrasound. As controls, a second set of parallel treatments was established, which differed only in that the sonotrode was not turned on and the suspensions were occasionally stirred manually.

The samples were diluted in sterile saline, plated in triplicate on YEPD agar, and incubated for two to four days at 28°C. As expected, the temperature at which the assay was conducted had a strong impact on the residual viability of the suspension. Accordingly, no culturable yeast cells

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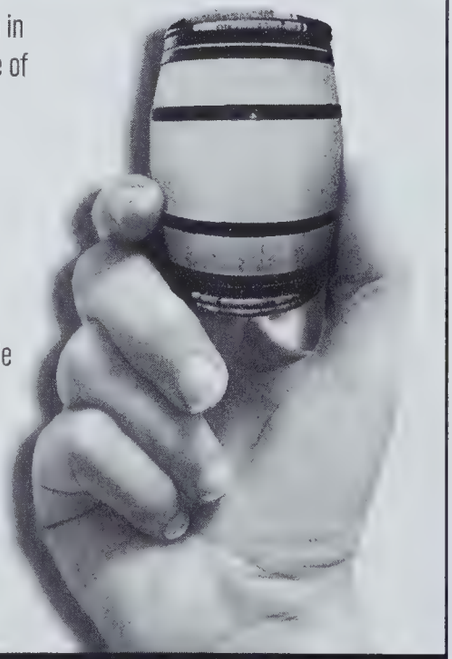

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were recovered from any of the 50°C treatments.

HPU proved highly effective at killing the inoculated *Brettanomyces/Dekkera bruxellensis* culture, such that after five- and seven-minute treatments at 40°C, 99.58% and 99.97% of viable cells were killed, respectively.

Conclusion

Cooperage remains an expensive consumable in wine production. Our industry research confirms that in-barrel wine spoilage and short barrel life are problems currently facing the wine industry as a whole. The useful life of a barrel varies according to its initial quality; the nature of the wine stored in it; the storage, cleaning, and maintenance regime; and winemaking objectives in subsequent use of the barrels.

Tartrate and solid residue buildup, both on the interior surfaces and in the pores, affects oak flavor transfer, wine maturation, and barrel life cycle. The infection of the barrel with spoilage microorganisms, especially *Brettanomyces/Dekkera* yeast, can have a marked influence on whether a barrel is reused, and hence the cost effectiveness of its purchase.

Spoilage costs are difficult to measure. Nevertheless, from our industry research and analysis we estimate that the losses to the world wine industry from avoidable wine spoilage exceed US$100 million per annum.

Our studies have clearly established that the present and most widely adopted cleaning technique of applying high pressure cold or hot water sprays to the interior of barrels does not ensure complete removal of tartrates and solid residues. We have demonstrated that HPU effectively removes tartrates and solid residues from the surfaces of oak barrel staves and planks, and inactivates viable *Brettanomyces/Dekkera* cells.

Due to the production of cavitation bubbles throughout the aqueous environment within the barrel, uniform cleaning of wood surfaces occurs on account of the even dispersion of cavitation bubbles and acoustic streaming. A similar ultrasonic activity is expected to occur in the pores of the wood where liquid is present.

Yeast and bacterial cells, pseudomycelia, fungal mycelia, and biofilms

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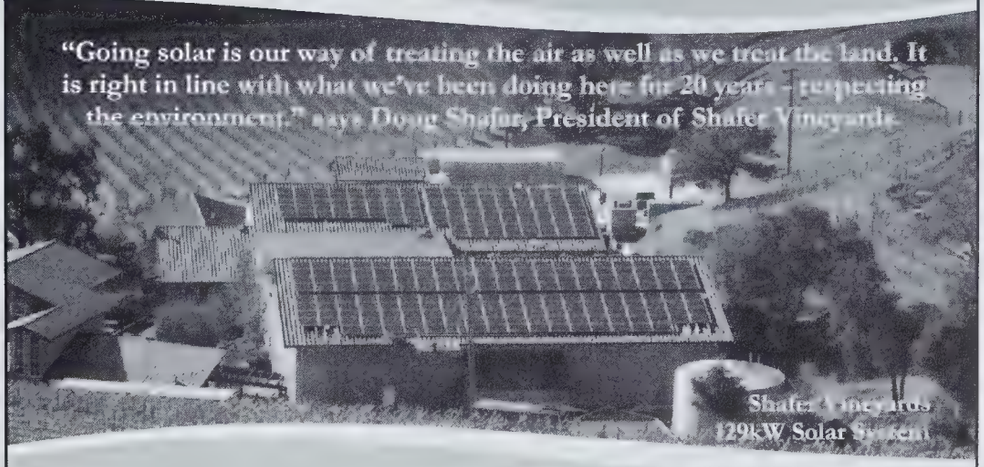
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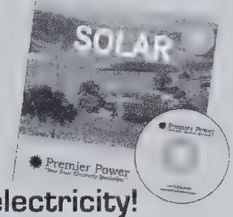

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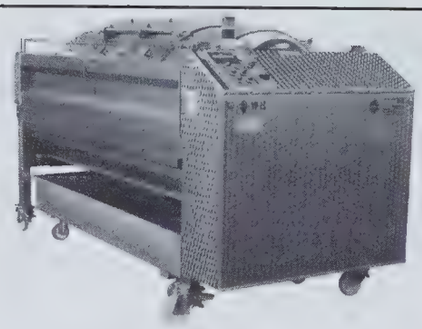
on barrel surfaces and in the pores of the wood are destroyed. Microbial structures and organic matter that are disintegrated and non-oak-derived taints are carried away as a result of acoustic streaming, thus unclogging the pores.

In summary, the application of high-power ultrasound for barrel and plank cleaning and sanitizing has the potential to provide considerable cost savings, through:

- elimination or avoidance of *Brettanomyces/Dekkera* spoilage or other microbial spoilage problems;
- effective, consistent, or uniform means (no "hit or miss") of cleaning the surfaces of barrels and inserts;
- reduced sulfur dioxide usage and avoidance of DMDC;
- non-usage of hazardous or taint-causing chemicals;
- no requirement for high or freezing temperatures;
- dual benefit of cleaning and sanitizing simultaneously;
- lower operational requirements;
- possible extension of barrel life (by one to two years) by effectively removing tartrates, solid residues, microorganisms, biofilms, and taint compounds from surfaces and pores;
- extending the useful life of planks/staves; and
- use of a clean technology, resulting in no chemical wastes from the cleaning process.

HPU represents a new approach to cleaning and decontaminating oak barrels. Use of an ultrasonic solution can bring about a significant improvement in winery net margin.

As an example, we estimate that a saving of at least US$.09 per bottle on a US$15 retail bottle price of wine is possible. Indeed, either avoiding wine spoilage in the barrel or gaining a modest extension of barrel life appears to justify an ultrasonic investment on both a return-on-investment and cash-flow basis.



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Further research is being done to gain more precise information on the beneficial effects of ultrasound on barrels and maturing wine. These collaborative projects are being undertaken by Cavitus Pty Ltd, the University of Adelaide, and University of South Australia. The Australian Research Council has provided funding for the above research and related projects to be undertaken over the next three years. ■

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Many wine industry personnel have contributed to the investigations described in this paper. Barrel examination is a time-consuming exercise that requires the assistance of barrel store supervisors/managers, forklift operators, and many coopers whose expertise is required to remove and replace headstaves without damaging the barrels. Winemakers, enologists, and wine microbiologists in Australia, New Zealand, California, South Africa, Portugal, and South America have been very supportive of our efforts to seek a superior method for inactivating viable *Brettanomyces/Dekkera* cells in the barrel. We would like to express our sincere thanks to everyone who has assisted in the investigations and this project. Our thanks also go the Australian Research Council.

Andrew Yap is a former lecturer in oenology and wine microbiology at the University of Adelaide and the former Roseworthy Agricultural College. He is currently Director of Oenology and Industry Marketing of Cavitus Pty Ltd, Adjunct Research Fellow at the University of South Australia, Honorary Lecturer in Wine Science at the University of Auckland, and Visiting Senior Lecturer in Oenology at the University of Adelaide.

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CURRENT THEORY AND APPLICATIONS
Micro-oxygenation

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Micro-oxygenation, like many procedures in the wine industry, can be an important component of the winemaker's toolbox. The purposeful, measured addition of oxygen to wine is a relatively recent practice that is still not fully developed.

The following is a review of the current theory of micro-oxygenation, its application, and ways in which winemakers can determine if micro-oxygenation is desirable for a particular wine.

Wine stored in barrels generally has more intense color and softer tannins than the same wine stored in stainless steel. The difference between the two is the oxygen exposure that occurs in barrels. Both barrel storage and aeration in tanks cause a decrease in free anthocyanin content, and an increase in color intensity and phenol polymerization (see Table I and Figure 1).

The potential goal of micro-oxygenation is to evolve the phenolic and aromatic characteristics of a wine by controlling oxidative changes. A wine's total capacity for oxygen saturation is approximately 6.3 ml/L at 20°C (68°F). Saturation levels increase with decreasing temperature and increasing pressure.[9]

It has been estimated that ullage from proper barrel storage adds as much as 15 to 20 ml/L per year of oxygen to wines. Therefore, allowing for several rackings, a total of around 30 ml/L could be added to red wine in barrel each year.[8]

The ability of a wine to handle oxygen depends on a number of factors, including the quantitative and qualitative nature of phenols. There is not a simple relationship between a wine's total phenol content and its oxygen capacity.[9]

During a typical racking, it is difficult to control the quantity of oxygen received and the result. The advantage of micro-oxygenation is that it is a controlled process in which a winemaker can quantify oxygen exposure. Figure II illustrates some general relationships among wine type, oxygen exposure, and quality scores.

Phenolic compounds in wine play a major role in both the color and mouthfeel and are important components impacted by oxygen. Phenolic components include a wide diversity of chemical structures and are grouped into two major divisions: non-flavonoids and flavonoids. The phenolic content in juice and wine is made up mostly of non-flavonoids and flavonoid phenols.[5] The non-flavonoids usually include simple phenols with basic structures such as benzoic and hydroxycinnamic acids.

The flavonoids contain a three-ring, 16-carbon structure. This group includes compounds such as anthocyanins, and tannin-building blocks such as polymeric flavan-3-ols, referred to as proanthocyanidins or condensed tannins. Thus, tannins are derived from simple flavonoids mainly from the skins and seeds, and are produced by oxidative or chemical polymerization to form larger structures.

Chemistry of oxygen in wine

Phenolic reactions in wine can generate modified tannins, degrade existing tannins, or generate new ones. As such, polymerization and de-polymerization of tannins, and of tannins and anthocyanins, greatly impact their sensory characteristics. Winemakers have traditionally assumed that the distribution of various-size condensed tannins extracted from the seeds and skins depended entirely on fruit maturity. However, condensed tannins are likely

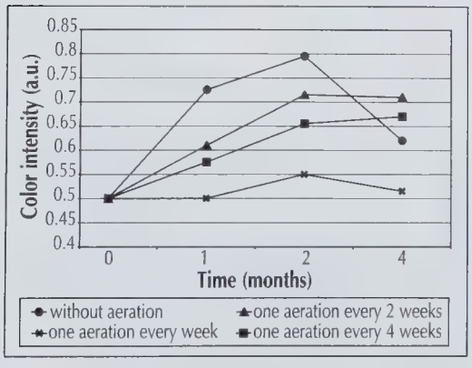

Figure I. Effect of aeration on color intensity of red wine over time; from Ribereau-Gayon and Glories (1983).

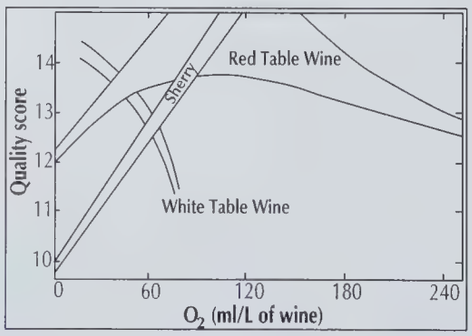

Figure II. Quality responses of two white wines, two red, and a chermat after weekly oxygenation for up to a year; from Singleton (2000).

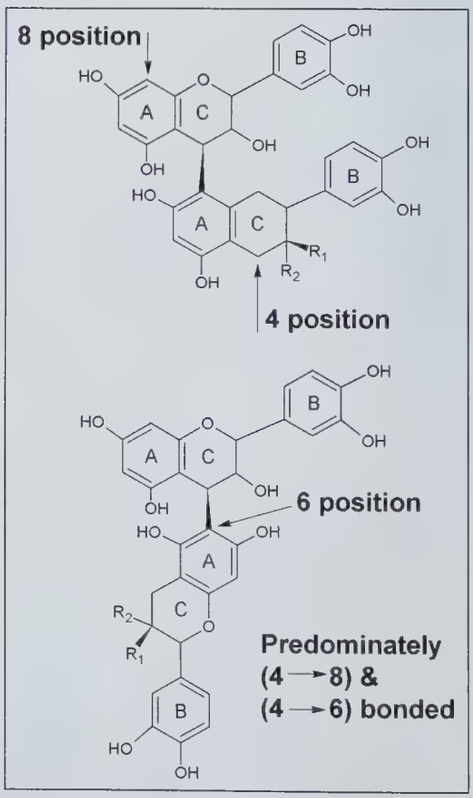

Figure III. Flavonoid phenol polymerization binding sites.

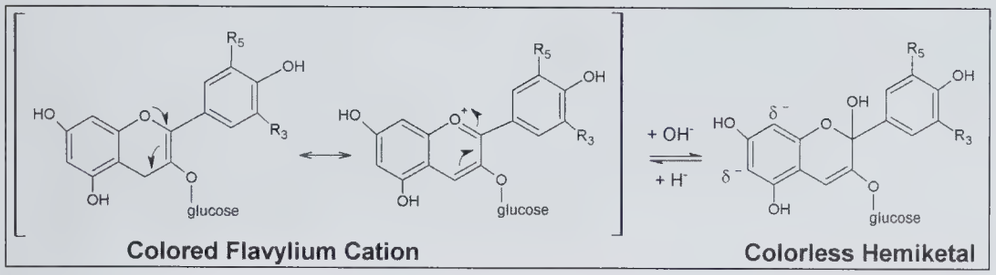

Figure IV. Anthocyanins in the hydrated and reactive forms. With hydration comes an increase in electronegativity at the 6 and 8 positions.

not stable. Hydrolysis at the C4-C8 position or the C4-C6 position likely occurs (Figure III).

With oxygen exposure, several different structural linkages can occur creating tannin polymerization. Polymerization reactions that occur between anthocyanins and tannins may generate stable compounds, which provide more color intensity and are more resistant to degradation.[1]

Anthocyanin molecules have a positive charge that enables them to absorb light and thus have color. This positive charge is usually assigned to the oxygen atom in the aromatic C-ring structure; however, the charge is widely spread throughout the molecule (Figure IV). The positive charge increases the reactivity of the ring structure, which can lead to the destruction of the positive charge. This is countered by binding with tannin molecules, such as can occur with micro-oxygenation. The degree to which tannins and anthocyanins bind together is, in part, a function of the concentration of these molecules in solution.

An anthocyanin also has a carbohydrate (sugar), usually glucose, esterified or bound at the carbon-3 position. Naturally occurring pigments from grapes always have a sugar bonded at the carbon-3 position (though other compounds can be involved, such as

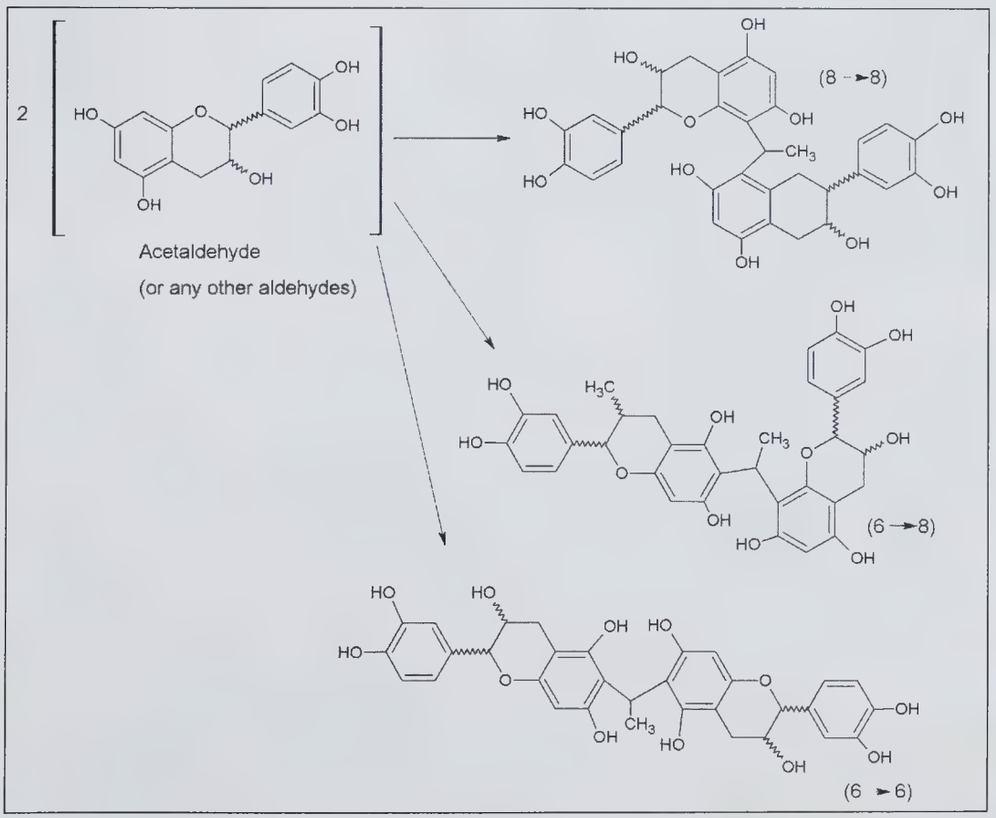

Figure V. Acetaldehyde bridging.

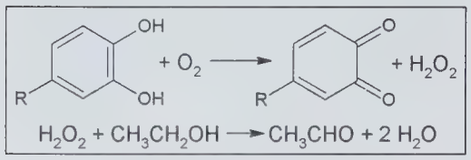

Figure VI. Oxygen leading to the production of acetaldehyde through a vicinal diphenol on a flavonoid phenol.

acetic acid and hydroxycinnamic acid). The presence of this sugar helps the anthocyanin maintain solubility. If the sugar is hydrolyzed or removed, the solubility decreases and the molecule will be destabilized and lost (a problem, for example, noted in wines that have experienced *Brettanomyces* growth).[3]

Anthocyanins and tannins bind together in two ways, depending upon the oxygen concentration. Under reductive conditions (low redox potential), hydrolysis may break down a tannin molecule, producing two products, one charged molecule and one neutral molecule. Depending on the concentrations of tannins and monomeric anthocyanins, the charged molecule formed will react with one or the other. If it is another tannin, a longer oligomer or polymer will be formed.

However, the process differs if an anthocyanin is involved. An anthocyanin, in the hydrated or colorless form (Figure IV), provides an electron-rich molecule which more readily reacts with the charged tannin. The reaction occurs between the two molecules at the carbon-4 and carbon-8 positions, and a covalent bond is formed. Once formed, the larger tannin moiety acts as an electron sink and a stabilized color or anthocyanin-tannin adduct is produced. The terminal molecule, the anthocyanin, no longer has available electrons in excess to further react, meaning that the anthocyanin acts as a terminus for any further reaction at this end of the polymer.

The other tannin-anthocyanin reaction method involves oxidative polymerization. As such, acetaldehyde can play an important role in the formation of phenolic polymers in a wine and, thus, in micro-oxygenation.

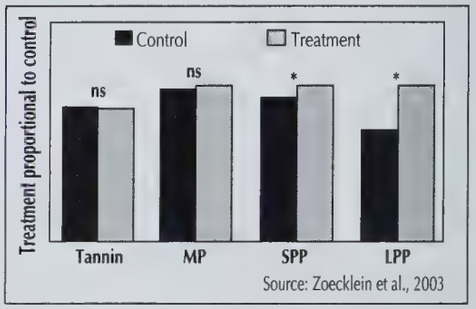

Figure VII. Effect of micro-oxygenation of Merlot wine on the relative concentration of total tannin, monomeric pigments (MP), small polymeric pigments (SPP) and large polymeric pigments (LPP).

Acetaldehyde-bridged molecules form to bind phenolic compounds together. These compounds are relatively stable and are somewhat resistant to bleaching by bisulfite ion (which is why sulfite bleaching is used in some assays). Acetaldehyde bridging can also facilitate the formation of tannin-tannin complexes. Acetaldehyde linkages usually lead to C8-C8 bonding instead of C4-C8.[1] This can lead to different sensorial properties. Cross-linking of procyanidins with aldehydes is illustrated in Figure V.

Acetaldehyde can be produced by yeast during fermentation, can result from the coupled oxidation of ethanol by phenolics, and can be produced by adding toasted oak wood into a fermentor.[10] H.L. Wildenradt and V.L. Singleton showed that the oxidation of ethanol to acetaldehyde occurs in the presence of O_2 at an appreciable rate.[12] This coupled reaction involves the oxidation of a simple phenol (vicinal diphenol) to produce a colored molecule (orthoquinone) (Figure VI).

Hydrogen peroxide (H_2O_2) is produced as an intermediary of coupled oxidation. H_2O_2, a strong oxidant, then reacts with ethanol to form acetaldehyde (Figure VI). The newly-formed acetaldehyde can react with phenolics in a wine. Acetaldehyde forms a polymerization product between anthocyanins and tannins through an aldehyde bridge, for example. These can further react with other procyanidins

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Table I: Effect of conservation conditions on the evolution of the color of red wine over a 16-month time period. From *J. Ribereau-Gayon and Y. Glories (1983)*

Conditions of conservation	Antho-cyanins (mg/L)	Color intensity (a.u.)	Poly-merized pigments index
Non-aerated tank	340	0.63	56
Aerated tank	240	0.72	66
Wooden barrel	240	0.75	64

Note: Initial anthocyanins content 500mg/L; initial color intensity 0.6

or anthocyanins, to form more complex trimers.

In order for this to proceed, adequate levels of acetaldehyde must be available. SO_2 will readily bind to any free acetaldehyde, thus removing it as a reactant. (For this reason, sulfite addition can be used to evaluate the sensory impact of acetaldehyde in an "aroma screen.")[13]

In order to achieve the desired results from acetaldehyde-induced coupling, binding must occur before the wine is sulfited, or the free SO_2 level should be low (15 ppm depending on pH). This usually means SO_2 additions are postponed until after micro-oxygenation is complete.

Acetaldehyde can also bind with another procyanidin molecule, instead of the anthocyanin as above, with the reaction proceeding in the same way. The reaction may continue to produce more highly polymerized molecules. It is thought that the reaction stops when anthocyanin molecules "cap" either end of the structure.[3]

A goal of micro-oxygenation is to modify phenolic compounds, especially polymerized tannins, to create a more rounded, softer mouthfeel in the wine. Preventing extensive tannin-tannin polymerization from occurring may help in accomplishing this goal.

Micro-oxygenation/wine structure

The sensory perception of astringency is due to the interaction between polyphenols and salivary proteins in the mouth. These result from the hydrophobic and hydrogen-bonding effects of the phenolic compounds.

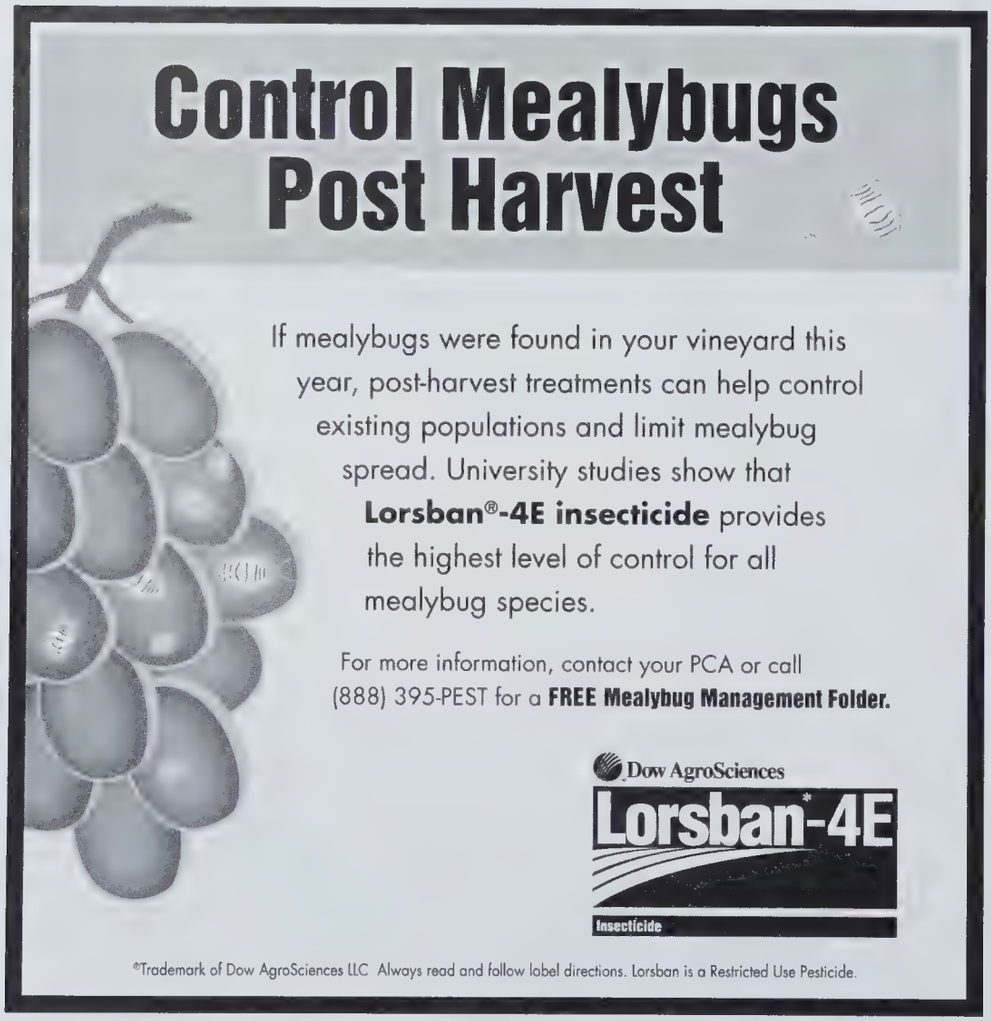
A wine's astringency has been found to be largely a tactile sensation. This has lead to the idea that the interaction between polyphenols and salivary proteins results in insoluble aggregates that precipitate and obstruct the palate lubrication, thus causing the unpleasant sensation of roughness, dryness, and constriction.[4] It has been found that the extent to which condensed tannins elicit astringency increases with the degree of polymerization,[7] although this is an oversimplification.

It is believed that micro-oxygenation may affect astringency by changing the way tannins polymerize and create large globular structures[14] (Figure VII). It may help to do this by increasing the reaction of procyanidins with other molecules, thereby limiting aggregation.

Another way oxygen could affect procyanidin interactions is by increasing the proportion of C4-C6 linkages and thus reducing the number of C4-C8 linkages. Procyanidin dimers linked through a C4-C8 inter-flavonoid bond have consistently greater tannin specific activity (TSA) for proline-rich proteins (such as saliva) than their counterparts with a C4-C6 linkage. Thus, C4-C8-linked phenols are perceived as being bigger and more aggressive.

The addition of acetaldehyde linkages promotes tannin polymerization through C4-C6, and C8-C8 bonds. These linkages may also have smaller TSAs than their C4-C8 counterparts, resulting in a more supple perception.

Tannin polymerization stops when anthocyanins occupy the terminal ends of the structure.[3] By increasing the potential for forming these bonds, it may be possible to decrease the size of the condensed tannin polymer. However, this is highly dependent on the stage that the tannin molecules are in, prior to oxidation. If the procyani-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din molecules are only slightly polymerized, their condensation with the anthocyanins leads to formation of stable end-products with greater spectral color.

However, this same condensation, along with tannins that are already highly polymerized, forms unstable pigments that will precipitate. For this reason, aeration has been found to be most effective during the period immediately following completion of yeast fermentation, prior to extensive polymerization.

At that time, tannin molecules are only slightly polymerized, and their condensation with anthocyanins in the presence of air leads to stable, colored pigments. If aeration occurs later, the tannins are then polymerized, and further condensation with the anthocyanins causes their precipitation.[2]

However, many other factors also affect the intensity of astringency besides the size, or degree of polymerization, of tannins in a wine. Ethanol, acidity, viscosity or sweetness, and the concentration of phenolics all affect astringency in wine.

Table II: Correlation coefficients between wine sensory attributes, each correlated independently against others.

		R value (correlation coefficient)						
		Fruit	Vegetative	Oxidation	Off aroma	Green tannin	Tannin grit	Plushness
P value	Fruit		–0.938	–0.448	–0.958	–0.836	–0.590	0.784
	Vegetative	0.0006***		0.354	0.862	0.910	0.796	–0.782
	Oxidation	0.2661	0.3903		0.600	0.127	0.233	–0.389
	Off aroma	0.0002***	0.0059*	0.1184		0.711	0.471	–0.770
	Green Tannin	0.0097**	0.0017**	0.7642	0.0482*		0.841	–0.824
	Tannin-Grit	0.1237	0.018*	0.5783	0.2394	0.0088*		–0.721
	Plushness	0.0212*	0.0218*	0.3410	0.0253*	0.0119*	0.0436*	

*indicates significance at p≤0.01
**indicates significance at p≤0.05
Source: Sullivan, P., 2001, MS thesis.

Micro-oxygenation/wine aroma

The introduction of oxygen may help to modify wine aromas. It has long been known that aeration can impact some sulfur-like odor compounds, either by volatilization, oxidation, and/or slight changes in the oxidation-reduction potential. For example, hydrogen sulfide can react with oxygen to form water and elemental sulfur, although the extent of that reaction is likely limited:

$$2H_2S + O_2 \leftrightarrow 2H_2O + 2S$$

The above reaction is governed by the wine's redox potential, and can go back the other way.

Micro-oxygenation can change the redox potential and convert some wine thiols to disulfides. For example, the transformation of methanethiol (methyl mercaptan) to dimethyl disulfide results in a change in the sensory character and threshold due to a small change in molecular structure. The perception threshold goes from about 2 ppb to 12 ppb.

$$2\ CH_3SH + \tfrac{1}{2}\ O_2 \leftrightarrow CH_3SSCH_3 + H_2O$$

Methyl mercaptan **Dimethyl disulfide**

This helps to explain how micro-oxygenation can "clean-up" and help aromatically "balance" some wines. It should be noted, however, that the above reaction is reversible. As such, wines bottled and stored under reducing conditions can have the disulfide reduced back to the thiol.

Another way in which oxygen may affect the sensory properties of micro-oxygenated wines is through the transformation of certain vegetal aromas, or their perception. Compounds such as 2-methoxy-3- (2-methylpropyl) pyrazine can be detected by humans in water in concentrations as low as 2 ng/L. This chemical contributes to the characteristic aroma of vegetables such as bell peppers. The highest concentrations are found in the coldest fruit maturation conditions.[6] The authors have reported reduction of herbaceous character as a result of micro-oxygenation.[13]

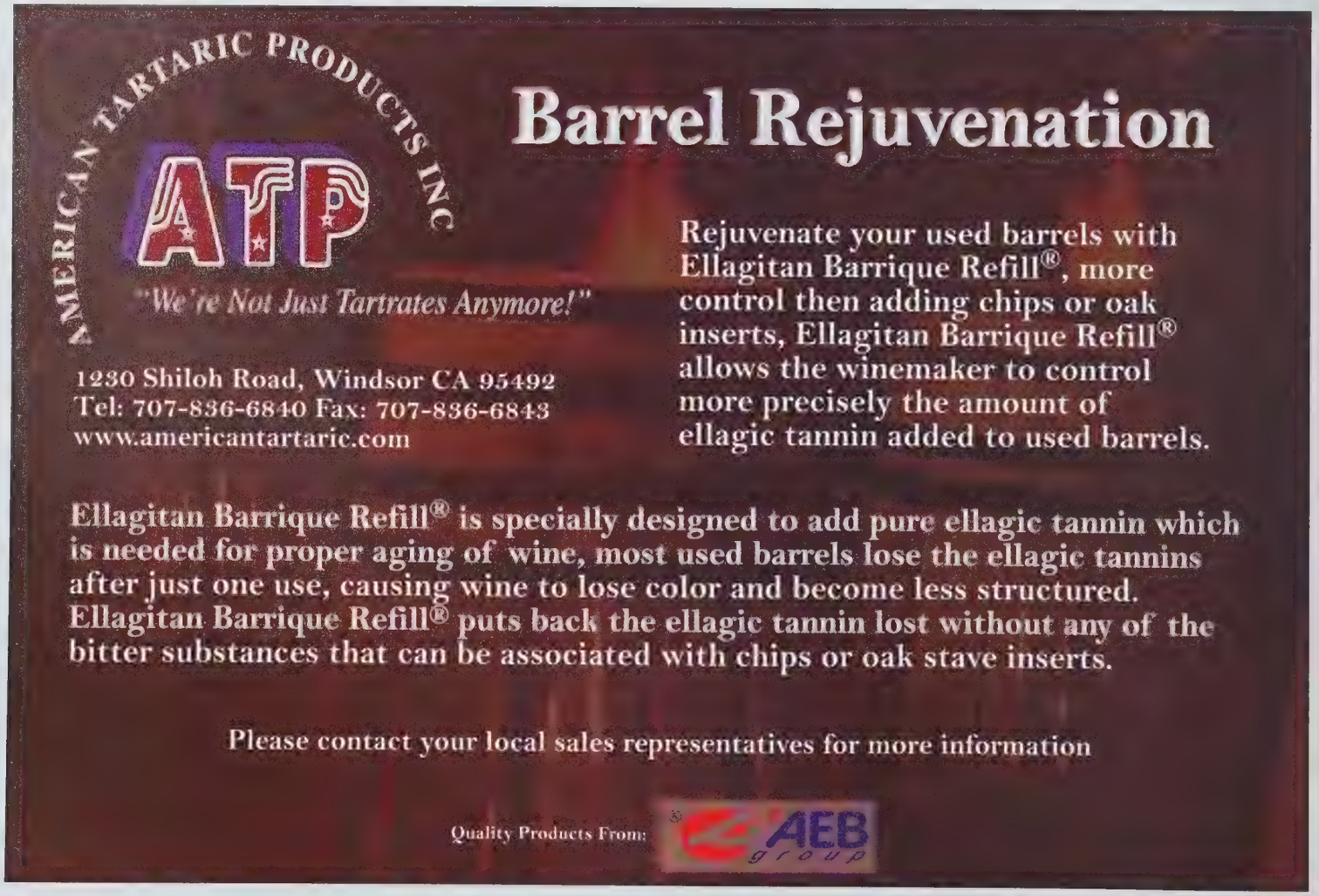
Initially, we presumed this reduction was the result of transformations or changes in the pyrazines. That appears not to be the case. Rather, the lowering of the perception of herbaceousness of some wines with micro-oxygenation may be the result of changes in thiols (sulfur-like off-odors). This demonstrates the sensory relationships between thiols and herbaceousness. Thiol odor in wines complements the herbal perceptions from pyrazines and, indeed, some thiols may contribute to "green"-type odors.

Brettanomyces can decarboxylate 4-vinylphenol to 4-ethylphenol. One important concern with regard to micro-oxygenation is that it can stimulate *Brettanomyces* growth. Careful monitoring of 4-ethylphenol production and "Brett" plating should occur for wines treated by micro-oxygenation.

Table II lists some wine sensory descriptor correlations. These relationships illustrate some changes in wine sensory attributes that may be achieved with micro-oxgenation.

Is micro-oxygenation for you?

Micro-oxygenation can be an important addition to a winemaker's tool box, but it must be used with discretion, and it will take a learning curve to determine how it will work in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The easiest way is to arrange for a trial through a company that sells micro-oxygenation equipment. The basic outline of the experiment follows, but the details would need to be developed in concert with your chosen supplier.

Pick a wine that will most likely give you the biggest income or quality boost, take one barrel of that wine and follow it through a cycle that ideally would begin post-fermentation and pre-malolactic, and then treat it with small to medium amounts of oxygen for each time frame. Take dual samples every week, and top off the barrel with wine to replace those samples.

Run the experiment through to the bitter end where the wine seems as if it is totally over the hill (it is important to work out the actual steps with your supplier). Take those samples, put them aside for several months, and then open them all at once and evaluate them against your control. You should see the influence of the oxygen on the wine and you should be able to make a judgment from that experiment. ■

To receive reviews on micro-oxygenation and other topics, see the Enology-Grape Chemistry Group, Virginia Tech website: www.vtwines.info.

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Patrick Sullivan was a Master's student under Bruce Zoecklein and others at California State University Fresno, and is now an enologist at Paul Hobbs Winery in Sebastopol, CA. Some content was adapted from his MS thesis.[11]

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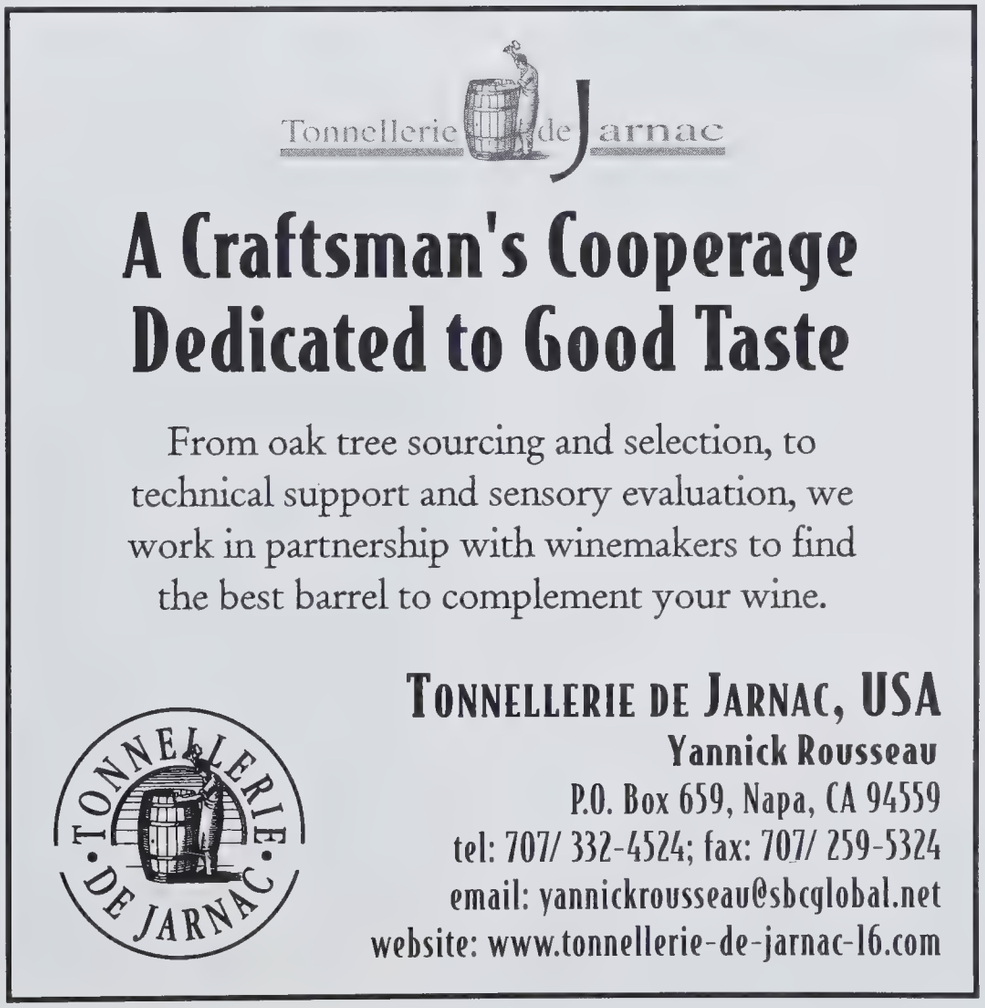
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MICRO-OXYGENATION

Innovation for the winemaking toolbox

BY Henry Work

Micro-oxygenation (microOx) techniques and equipment have made significant advancements since the first experiments, carried out in the 1990s, to soften heavy red wines of the Madiran region of France. More than 100 wineries in the U.S., by some estimates, are using microOx.

At least three suppliers in the U.S. offer an array of equipment to meet the needs of any winery, regardless of size. This article shares the experience of ten U.S. wineries that are using microOx systems.

There are many reasons why winemakers use this process to introduce controlled amounts of oxygen into a wine — from wine enhancement, to better oak integration, faster barrel ageing, to fix problem wines — in almost all stages of the winemaking process.

In the last several years, Don Blackburn, Randall Graham, and Tom Cottrell, among others, have published excellent reports outlining the technology involved with micro-oxygenation (microOx); this report will update the techniques they described and provide current thinking about how microOx is utilized in wineries.

Stonestreet

Graham Weerts learned about microOx in his home country (South Africa), applying it to Cabernet Sauvignon, Merlot, and Shiraz. Upon arrival as winemaker at Stonestreet (Healdsburg, CA), in Alexander Valley, he found high tannin wines coming from certain mountain vineyards that the winery blends into its Cabernet bottlings. These, he thought, might benefit from the selective use of microOx.

The 2004 vintage, with a hotter than normal growing season that stressed many shallow-soil, mountain vines, provided a perfect opportunity to apply microOx technology on individual lots. For the past two years, he has rigorously tasted the many lots and choosen a few — those with high pyrazine (bell pepper) or related compounds, a "sandy or grippy" tannin mouthfeel, or sulfides — to add oxygen.

Master box of the new Visio 6 micro-oxygenation system from Oenodev. It is expandable to a total of 60 diffusers and is fully automated with safety features. It has capability for remote operation, controlled from the winemaker's office, and can be set to express O_2 measurement in either mg/l/mo or ml/l/mo.

Weerts feels that the opportune time to add oxygen is right after primary fermentation. Using a trial chart developed by Oenodev (microOx equipment supplier), he and his associates taste the wines for acetaldehyde, sulfide, and vegetal intensity, fruit expression, and tannin evolution. Then, monitoring for dissolved oxygen (DO), oxygen is slowly introduced, typically at less than 10 mL/L/month.

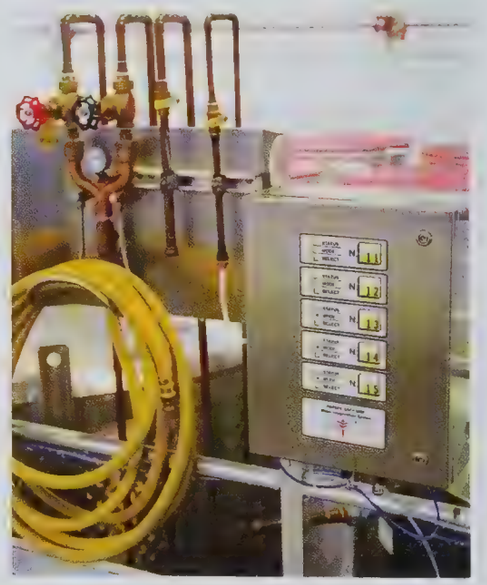
Daily and weekly tastes are used to scrutinize the perceptive changes in the wine, and allow the winemakers to determine the needs for additional doses of oxygen. Dissolved oxygen content is also a marker for increasing or decreasing the amount of oxygen. Weerts does not want it to go above 1ppm DO.

Typically the microOx application continues for one to three months, through malolactic fermentation (MLF). The stopping point is a judgment call, based upon a collective feel for when the wine has reached its optimum, and is ready to go to barrel.

Stonestreet Cabernet Sauvignon is aged in French oak barrels, and the lots that have been micro-oxygenated seem to need slightly more SO_2 additions. However, according to Weerts, they integrate extremely well with the oak.

Dunnewood Vineyards

George Phelan, winemaker/general manager of Dunnewood Vineyards



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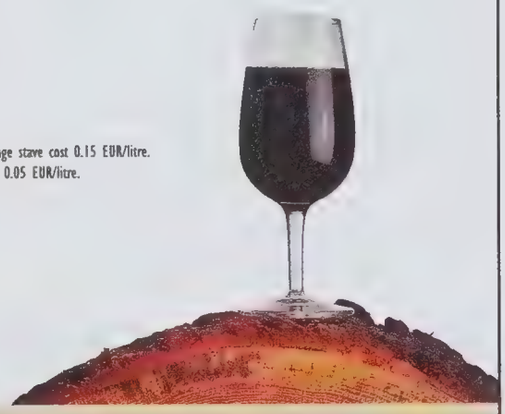

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(Ukiah, CA), divides his rationale of the use of microOx between those wines that have problems, such as H_2S, and those that need further development, particularly press and blending lots, which have structure but need a push to soften the tannins or enhance the fruit. While reds have been the primary targets, he has used it on Sauvignon Blanc to reduce a H_2S problem.

Phelan incorporates microOx as soon as the wines are dry, in October or early November. Often oak chips and/or oak inserts are added at the same time. O_2 rates can go as high as 30 mL/L/month. If the microOx is still in use after MLF, and after SO_2 adjustments, the O_2 rates are reduced to 3 to 4 mL/L/ month.

"We use microOx on virtually any tier of wine, depending on what we are trying to accomplish," Phelan explains. "If we are trying to resolve some of the tannins, or remove some H_2S, we may use microOx on any wines that will be aged in barrels after microOx. Otherwise, we use microOx and barrel staves and/or chips on California appellation wines that may not see any other wood."

With a portable Oenodev system that can be moved from tank to tank, Phelan and his crew usually only microOx 10 to 20 lots per year; however they do expect that to increase its use as they gain confidence with the equipment and it's potential.

Hogue Cellars

Hogue Cellars (Prosser, WA), has 10 years of experience in using microOx. Jordan Ferrier, red winemaker, has been a key player in the development of this new technology. With high quality grapes coming from their vineyards, Ferrier rarely needs microOx to correct problems. Rather, he utilizes microOx on all reds in the Hogue, Genesis, and Reserve lines to "move the wines forward," and to facilitate integration in the barrel.

The Genesis goes into 35% new American oak barrels each year, and the Reserve into 75% new French oak. MicroOx is used sparingly with tank-fermented Chardonnay, in conjunction with oak additives, to reduce tankiness.

There are 62 Oenodev units that can supply microOx through a custom manifold to almost any tank in the winery.

On the problem-fixing side, Ferrier has occasionally detected garlic and onion flavors in wine (in barrels). On those occasions, he has pulled the whole lot of wine from the barrels into a tank where O_2 is gently pumped at low rates in order to minimize those aromas. The wine is then returned to barrels.

In conjunction with microOx used on tank-fermented Chardonnay, oak inserts (attached in the tank in the form of fans), are added to enhance the structure and add oak flavor. The microOx rate used for the Chardonnay

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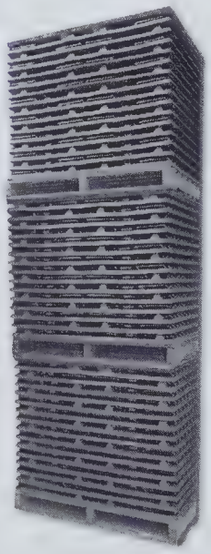

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Unfortunately, research laboratory analysis of microOx results is only just beginning, and winery lab analysis is, for the most wineries, in its infancy. Tasting by winemaker is the main, and preferred, method of deciding what, when, and how much microOx is necessary. Ferrier, along with other winemakers noted in this report, repeatedly emphasized this.

Hogue now uses Orbisphere dissolved oxygen meters, which can measure in hundredths of a milligram, as opposed to an Orion which measured in single milligrams. Using these meters, Ferrier likes to keep most of the wines in the 0.075 mg/L range, attempting to integrate the oxygen rather than dissolve it, and monitoring the dissolved oxygen as microOx proceeds.

At Hogue, microOx begins right after primary fermentation, and continues until MLF is 95% complete. The rationale for ending at around 95% is that ML bacteria consume/scavenge the remaining aldehyde at the end of MLF that was generated by the O_2.

With his long experience, Ferrier is sensitive to the use of microOx in his and the wines of others. Wines with overdone microOx feel "fried on the tongue," or dried out, with a plastic-like aroma and consistency. "MicroOx conducted on its own is OK, but seems to do much better in the presence of oak," says Ferrier.

Mondavi Woodbridge

At Mondavi Woodbridge (Woodbridge, CA), Todd Ziemann, winemaker, uses microOx on a wide range of reds (Merlot, Cabernet Sauvignon, Syrah, Petite Sirah, Tannat [the predominant variety of Madiran, France were microOx started], Petit Verdot, Malbec, Barbera, and Ruby Cabernet) and occasionally Chardonnay. For the reds, color and fruit development, palate fullness, diminished reductiveness, and improvements in the vegetal characteristics are the reasons for using microOx.

MicroOx is done in tanks with oak inserts, regardless of whether a wine will go to barrels or not.

"At times, we will microOx Chardonnay to help control the reduction potential when ageing *sur lie* in stainless steel tanks," explains Ziemann. "Our goal is to age on yeast lees, and using small amounts of microOx with lees stirring can be beneficial in keeping the wine in the positive (sweet aroma) direction. Not all white wines react in this way, you need to be very careful."

Both the Oenodev and Parsec equipment are used and the advantages of both systems are still being evaluated. MicroOx is done right after fermentation and continued through MLF. After MLF, with the rate of oxygen reduced, microOx is continued for only two to four weeks.

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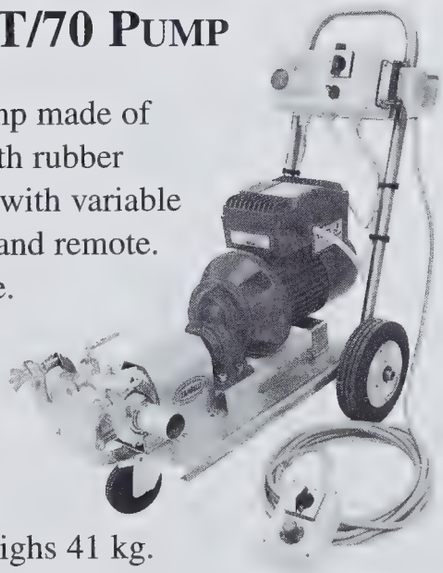

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Along with regular tasting, the dissolved oxygen is monitored daily, especially with the higher rates used early in the program, to determine the amount of O_2 needed. Regular monitoring of free SO_2, VA, pH, TA, malic acid, and temperature is also done.

Some aldehyde formation is desired, so SO_2 is added only after MLF, and is adjusted to 20 ppm free. In the early stages of microOx, temperatures are kept at 18°C (64°F) and then lowered to 14°C (58°F) after MLF. Ziemann is very aware of the increase in dissolved oxygen as the temperature drops.

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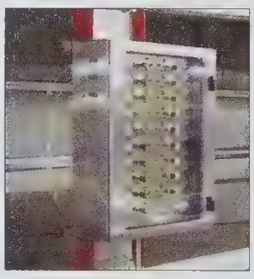

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Deciding whether a wine should receive microOx is often difficult, especially when the parameters are marginal. Ziemann uses the following to make determinations:

Sugar — close to dry, no higher than 2 to 3 g/L,
Acidity — not critical,
pH — 3.7 or lower,
Color — visual,
Tannin — winemaker taste,
Reduction character — winemaker taste.

Ziemann emphasizes that microOx, like all winemaking technology, needs to be incorporated into the total winemaking program. He and his team started with small experiments in 1998, and then put it into limited production in 1999. Experience gained each year has been invaluable.

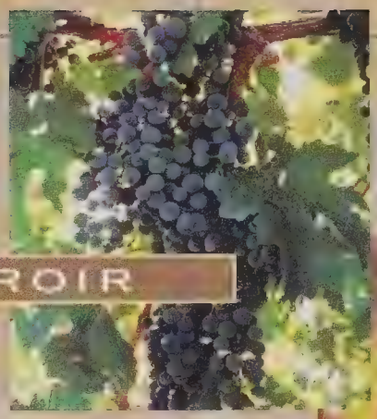
He notes with the improvements that, "the equipment is much easier to use being computer-based/web-based. One can monitor more lots in much less time." He sees the use of microOx as a continuum and will be examining other varieties to see if they might benefit from microOx.

While not normally noted, wine ageing and enhancement of the wine/food paring are also considerations for the use of microOx. Ziemann's experience, while still rather limited, is that microOx doesn't detract from either age worthiness or wine/food paring.

Sebastiani Vineyards

Long-time winemaker at Sebastiani (Sonoma, CA), Mark Lyon realized that he needed to change some of his production dynamics as the winery increased production in the late 1990s. The demands of trying to barrel age some 400,000 gallons of moderately priced ($10 to $17 retail) red wine in a limited time span became logistically impossible.

In 1999, he enlisted the expertise of Oenodev to set up a microOx program for his Cabernet Sauvignon, Merlot, Pinot Noir, and Syrah programs. His objective was to modify and soften green tannins with microOx in tanks with chips and inserts, prior to being placed into older, neutral barrels. With the integration achieved by microOx



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and wood in the tanks, the wine in neutral barrels achieved the same aged character as the wines going into newer barrels.

In Lyon's experience, the microOx process seems to build an aldehydic bridge, minimizing the drying of the tannins, and reducing the time needed in barrel.

As his experience with, and knowledge about microOx increased, Lyon realized another advantage. With the huge quantity of grapes required for the production, picking every block at optimum ripeness became increasingly difficult. The use of microOx on early-picked grapes reduces herbal and veggie characteristics.

Lyon starts microOx as soon as a wine is dry at a rate of between 20 to 80 mL/L/month. This continues until MLF is complete, and then is reduced to much lower levels. As long as no Brett or VA is detected, no SO_2 is added. Weekly measurements of DO, VA, SO_2, and clarity accompany the tasting regime.

Lyon desires a pH of 3.5 to 3.6, dissolved oxygen at 0.4 ppm maximum, and temperature for the reds at 57° to 63°F, or slightly lower for Pinot Noir. In large tanks, circulation is part of the drill, and he will occasionally request a racking to disperse the oxygen throughout the tank.

According to Larry Biagi (American Tartaric Products), the diffusers will create their own circulation in tanks up to about 15,000 gallons. Beyond that, a pump is needed to make sure the microOx wine is dispersed in the tank.

Lyon feels that the finished taste and market acceptability of these wines is maintained by the use of microOx, despite the slightly shortened barrel ageing period. He also feels that the wines marry well with food due to their softness, fresh fruitiness, and minimal dryness.

Experience is a big factor in using microOx. Lyon recommends hiring consulting assistance when purchasing microOx equipment to ramp up the experience level quicker, and minimize any potential problems. A little bit of hand-holding and side-by-side assistance of an experienced microOx taster will go a long way towards making the initial microOx attempts successful.

In the future, Lyon wants to see better phenolic testing, and he is experimenting with Lysozyme in order to delay MLF in order to utilize microOx additions a bit longer.

Scheid Vineyards

The investment in a microOx system can be substantial for a winery with many tanks like Scheid Vineyards (Greenfield, CA). With the labor required to set up and monitor each tank, all winemakers and winery owners need to consider the return on investment of this involvement. Scheid Vineyards installed a Parsec multi-unit system capable of feeding O_2 to 120 tanks.

MicroOx is employed on select wines designated for the bulk wine market. Dave Nagengast (winemaker) says, "Feedback from the bulk market indicates that the microOx process is definitely adding value to our wines."

Nagengast has used microOx for five years. He has tried different systems and selected Parsec for the recent winery expansion due to the controls and flexibility built into the system.

MicroOx is used post-secondary fermentation and SO_2 stabilization on bigger, more phenolic reds such as Cabernet Sauvignon, Merlot, Syrah, Petite Sirah, and Petite Verdot. Some custom-crush clients request it, and it is used, as noted above, for some wines headed to the bulk wine market. In both cases, the wines can be whole lots, or portions intended for blending. The purpose is to soften the tannins and improve color intensity.

Duration of the use of microOx is largely determined by weekly monitoring of the free SO_2 and DO and regular tasting. Researchers (Waterhouse and Laurie, 2006) noted that the O_2 tends to collect in layers. It is important to collect samples from low in the tank, or in larger tanks, to circulate the wine

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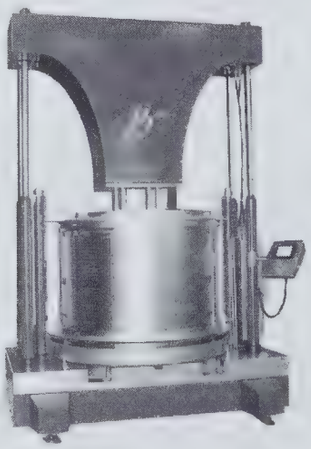
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to be sure of an accurate sample. During microOx use, tank temperatures are kept at 58° to 60°F. Typically, oak inserts are used in conjunction with microOx, rather than wine going to barrels.

MicroOx is continued until tasting indicates that the tannins have softened and the color is appealing. Stopping microOx will stop further aldehyde production, and allow the reactions to go to completion.

J. Lohr Winery

The Cypress line of wines from J. Lohr (San Jose, CA) is sourced from Central Coast grapes. Made in a fruit-forward style, the wines are primarily tank-aged. Winemaker Jeff Meier uses microOx, often in conjunction with chips or inserts on the Cabernet, Merlot, Shiraz, and Chardonnay wines in that line.

Chardonnay sometimes gets a hyper or macro-oxygenation dose; done to soften high phenolic juice prior to fermentation. The juice gets 9 ml/L of O_2 for one day, allowed to settle overnight, then racked off juice lees to start fermentation. During fermentation, 0.5 ml/L O_2, along with un-toasted oak chips, are added for sweetness.

MicroOx is also used at J. Lohr for high tannin, and/or over-extracted Cabernets and Merlot in the Estate Series. The rate is between 5 and 80 ml/L/month done primarily between primary fermentation and MLF to soften tannins. Chips or inserts are often added to reduce herbal and veggie characteristics, and to add an oak baseline with continued wine development prior to going into barrels. The results have been softer tannins in the finished wines, significantly boosting sales in the market place.

Meier uses both the mg/L and ml/L measurements (1 ml = 1.4 mg). This is because the winery utilizes both the Parsec and Oenodev systems. They started incorporating microOx in 2002, experimenting with several brands. Parsec and Oenodev were chosen for the service available, especially important in the early trials to help gain experience quickly; the safety features of the units, such as a back pressure monitor; single units that can control multiple tanks; and the ease of adjustments.

Meier notes that microOx is "a tool in the winemaker's toolbox." Like all tools, it is designed for specific uses. Meier tried microOx on Sauvignon Blanc with little success. He still feels that barrel-aged wines offer a bit more complexity and finesse than those aged in stainless steel tanks with microOx and oak chips or inserts. With the total cost of using microOx about one-third that of using barrels, for some wines, especially those selling at low price-points, microOx becomes an invaluable tool.

Havens Wine Cellars

Michael Havens, winegrower at Havens Wine Cellars (Napa, CA), started experimenting with the introduction of oxygen into wine in 1997 using homemade equipment. In 1998, after visiting Patrick Ducournau in Madiran in southwestern France, he learned more about the technique and realized that commercial equipment was available. He is utilizing an Oenodev unit to microOx select wines.

"MicroOx is not simply a tool to push a wine toward softness and marketability," states Havens, "that is always a choice the winemaker makes. He/she can just as well use microOx to make a hard-boned, long-ageing wine if so desired. Free/total SO_2 ratios are much higher in most microOx wines, a good technical advantage in itself."

It is the control precision that microOx provides that Havens appreciates, allowing him to make these decisions with confidence. But the use of microOx requires more direction from the winemaker, Havens emphasizes.

Tannin structure is a major consideration in the use of microOx. Havens defines the cyclical textural path of tannin as: 1) green, 2) hard, 3) firm, 4) soft, 5) round, 6) melted, and 7) green

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(when overdone). He feels it is usually best to bottle when wines are in the firm/soft stage.

Havens produces Merlot, Cabernet Sauvignon, Cabernet Franc, and Syrah. As these all have significant anthocyanin structure, he is comfortable using microOx for any of these wines, regardless of their tier in the winery production hierarchy. If he were making Pinot Noir or Grenache, with their typically lower levels of anthocyanins and tannins, he would be using microOx much less.

Havens' approach for an age-worthy wine is to micro-ox at 60 to 80 ml/L/month starting at primary dryness. The addition is then stepped down at about the same point when MLF finishes. SO_2 is added and the wine is settled. After two to three weeks, microOx is resumed, beginning at a rate of 40 ml/L/month, and then decreased to 5 mL/L/month for about one month. The wine is then ready for barrel ageing, where occasional additions of "punctual," or brief, oxygen continues to develop the wine.

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Hess Collection Winery

Dave Guffy, director of winemaking for the Hess Collection Winery (Napa, CA), applies microOx to cure the occasional herbal or vegetative character, or a reductive quality, from some vineyard lots of grapes for Hess's California Series wines. "Checking into the hospital" is his analogy for correcting these problem wine lots.

Guffy does not use microOx to reduce tannins or minimize the use of oak barrels, and the wines must have enough structure to tolerate the increase in oxygen. Done after MLF and sulfur additions, the treatment might last from one to six months, and the rate is typically at 1 to 5 mL/L/ month, adjusted by monitoring the taste of the wine. In the 2006 harvest, only two lots with H_2S required microOx.

The StaVin OxBox is used at Hess, shifting the several lines from tank to tank as needed. Guffy likes the simplicity of OxBox, requiring one to merely calculate the desired amount of oxygen, and then adjust the flow rate and set the timer. He and his crew taste every other week, and watch the dissolved oxygen rates in the wines. (The OxBox's back pressure meters are provided more to note when the sparge-tips are clogged rather than adjusting for tank pressure.)

Hanna Winery

While most wineries are using microOx in stainless steel tanks, Jeff Hinchliffe, winemaker at Hanna Cellars (Healdsburg and Santa Rosa, CA), pumps O_2 to Cabernet and Merlot placed in 1,100 to 3,300-gallon wooden uprights. Selectively using microOx on wine with good color and high tannins, this use of MOx in wooden tanks typically represents only 15% of the total blend. Oak inserts are

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Edited By Bruce Zoecklein

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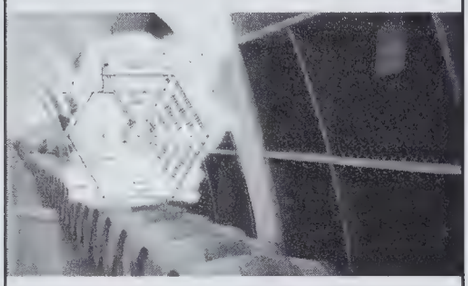

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added to get a jump on the oak integration prior to going to French, European, and American oak barrels.

Used after primary fermentation, Hinchliffe's rates are normally 3 mg/L/month until MLF, and then reduced to 0.5 to 2.0 mg/L. If a wine is on primary lees, a rate of 5 or 6 mg/L might be used. With the reduced rates, the wines can stay in tanks until mid-summer. Whenever using microOx, Hinchliffe and his staff monitor by tasting weekly, smelling for aldehydes, and checking the DO level. In a recent high press lot of Merlot the aldehyde rate rose, and the microOx rate was reduced.

Initially the sparger was placed through side valves on the wooden tanks. However this proved too close to the lees. Now it is dropped down from the top of the tank so that the level, just above the tank bottom (in the lees, if lees are present), can be more easily adjusted.

Current technology from suppliers

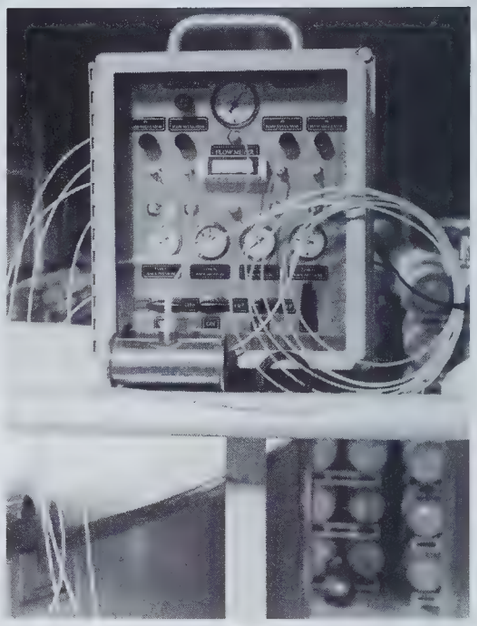
Like the real estate mantra of location, location, location, that for production winemaking should be control, control, control. With so many complex processes occurring during fermentation and ageing, the more a winemaker can do to keep any wine from going awry, the healthier his/her peace of mind.

The improvements in microOx systems in the past few years have focused on providing a winemaker with better control — upgraded rate flow control, better monitoring of the whole system, adjustments for container size, quick repairs for equipment problems, and being able to service more tanks or containers at any one time.

Westec OxBox

The Westec OxBox was developed by Dr. Jeff McCord, vice president of research at StaVin Inc. Westec/ Belli Corporation (Healdsburg, CA) manufactures, sells, and services the OxBox for the wine industry.

The OxBox is simple in design, utilizing a combination of electronic flow meter and mechanical flow controllers. An Excel spreadsheet calculator is used to determine flow rates needed to produce the desired microOx rate in a given volume of wine. This type of system operates independent of head pressure for tanks up to 66 feet in height. The system uses a 10-micron stainless steel diffuser, which minimizes fouling, positioned two to three feet above the tank floor.



Westec OxBox is comprised of one electronic flow meter and four individual mechanical flow controllers for each tank (four channels shown). Boxes are available with more channels.

McCord recommends microOx and StaVin Oak as tools to turn tanks into "barrels," adding oxygen only after MLF. While the winemaker never has complete control of vineyards and fermentation, there should be no need to microOx a wine prior to MLF. Ideally, the winemaker has harvested at proper maturity, utilized proper yeast nutrition, used macro-aeration, controlled temperatures, and pressed the wine off the fermented grapes at the proper time.

If this is the case, color stabilization has been initiated; and sulfide and vegetal characters have been minimized. Winemakers may then think of the tank as a barrel. They can then adjust the oxygen input to the wine to meet their desires for aroma, flavor, and texture.

For more information, contact: StaVin, Inc., tel: 415/331-7849, www.stavin.com OR Westec, tel: 707/433-9342.

Oenodev

Rich Jones is a consulting winemaker and representative for the Oenodev microoxygenation systems and Galina Seabrook

is the regional U.S. manager of Oenodev and microOx/ elevage consultant.

Oenodev is an outgrowth of the research that French winegrower Patrick Ducournau did in the early 1990s for high tannin wines grown in the Madiran region of southwestern France. Their continuing understanding of the process divides winemaking into three stages for using microOx:

Stage I — after primary fermentation and before malolactic fermentation — wine developing structure "structuration,"

Stage II — after malolactic fermentation when wine is harmonizing and SO_2 has been added,

Stage III — structure developed during ageing, and before bottling.

In Stage I — MicroOx is used to stabilize color, diminish the perception of vegetative tastes and aromas, increase structure, richness and youth, develop wine into more beefier and aggressive presence. Because of the high reactivity of a wine at this stage, amounts of 20 to 120 ml/l/mo O_2 are common. A higher amount of dissolved O_2 is also acceptable during this period. Thus, it is very important to start the treatment immediately after alcoholic fermentation, when there is an abundance of monomeric material in the wine.)

Stage II — This is a time when the SO_2 level will be adjusted. During this period, low O_2 addition rates of 1 to 10 ml/L/month are recommended. It is a time when the color of the wine is fixed; aldehydes are minimized, and the tannin molecules are polymerized, which softens them. The wine often develops a chocolate and cocoa richness.

During this stage, the temperature needs to be monitored. Lower temperatures, typical in the winter, increase oxygen solubility. Additionally, higher levels of SO_2 can limit the structuring effects of oxygen.

Stage III is the harmonization period. This would be the equivalent of wine ageing in barrels. Little oxygen is needed at this point; too much and the tannins become dry.

Oenodev components are computer-controlled systems capable of feeding one or many tanks. A ceramic diverter/sparger is used at Sebastiani where Lyon feels it provides very fine bubbles. The various computer units can deliver 0.5 to 200 ml/L/month for up to 60 tanks per control unit. Oenodev units are capable of switching to nitrogen as a back up, if the oxygen supply is accidentally used up.

For more information, contact: Oenodev USA, Inc., tel: 707/332-1078, www.oenodev.com.

American Tartaric Products

Larry Biagi is the senior winemaker with American Tartaric Products (ATP). His winemaking experience spans 40 years, including stints at Sonoma Vineyards, Pedroncelli, Geyser Peak, and Trentadue. Biagi and ATP represent the Parsec line of computerized gas controllers from Italy.

The Parsec system takes a different approach; instead of measuring the O_2 flow by volume (ml), as the StaVin and Oenodev systems do, the control unit measures out the desired amount of oxygen by weight (mg) which equals parts per million. This method adjusts for the temperature and pressure of the gas; and Biagi feels minimizes the margin of error. The computerized systems also adjust for the back-pressure of the tank height and/or a clogged sparger. Parsec systems are available for one to multiple tanks — the new system at Scheid Vineyards (Greenfield, CA) controls 120 tanks.

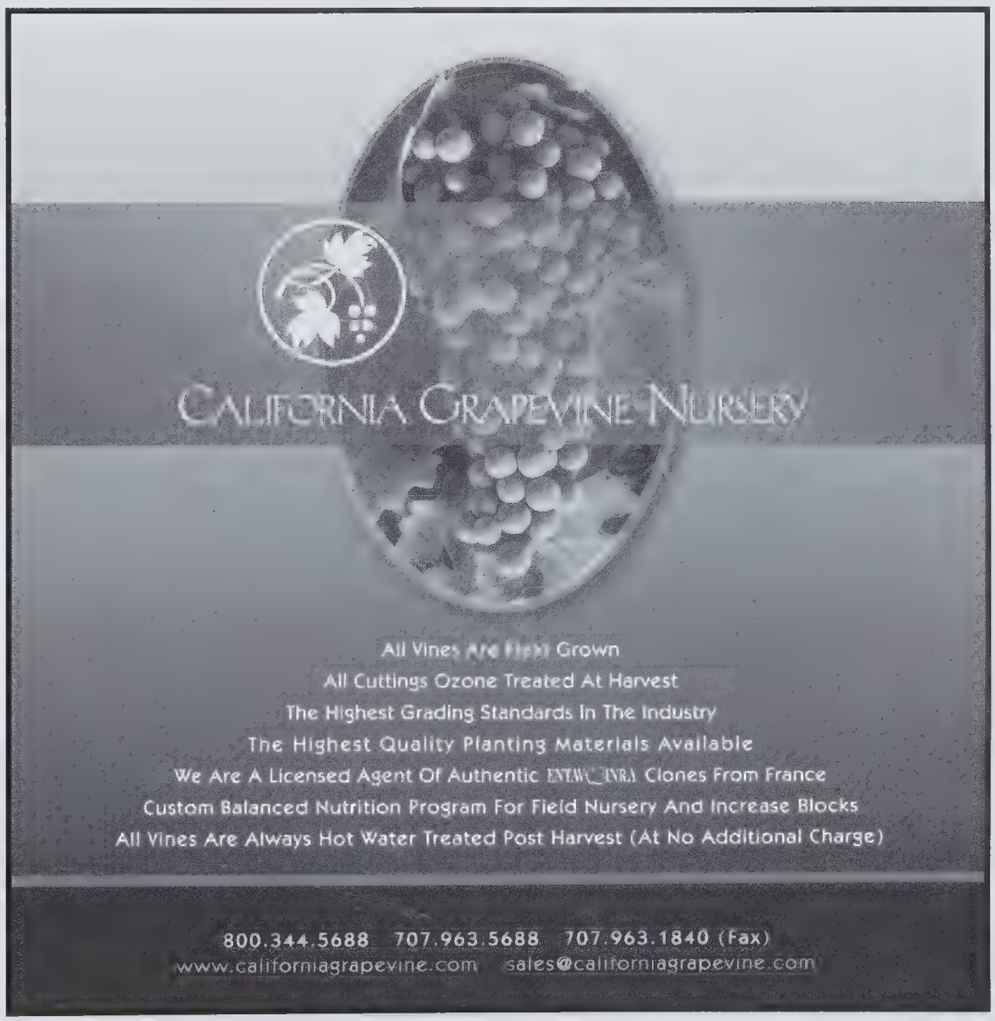
While ceramic diffusers are available, Biagi recommends their stainless steel sparger. The 0.45 micron holes disperse extremely fine bubbles, and are so small that the wine can't siphon back into the control units.

Both the ATP Parsec and Oenodev systems have the capability to monitor the wine temperature, real-time monitoring via the internet, and will soon be wireless.

For more information, contact: American Tartaric Products, tel: 707/836-6840, www.americantartaric.com.

Conclusions

While winemaking is based upon age-old traditions, the exciting part is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that innovative techniques, such as microOx, are like adding new colors to a painter's palette. MicroOx technology allows the winemaker more control, new methods of developing and enhancing flavors, and an opportunity to correct some vineyard-developed problems. Like the initial use of oak chips and additives, as more and more winemakers discuss the technology, microOx will become an accepted winemaking practice. ■

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Rancho Zabaco offers three tiers of Sonoma County Zinfandel

BY Jack Heeger

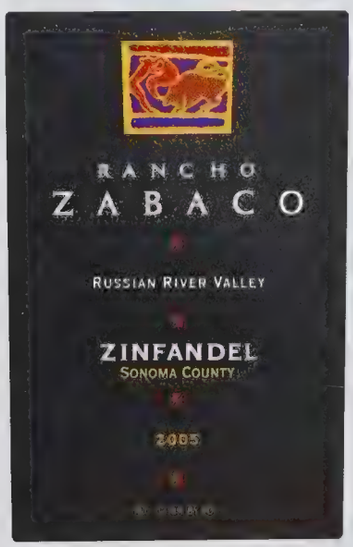
When E&J Gallo Winery bought Louis M. Martini Winery (St. Helena, CA) in 2002, it also acquired the famed Monte Rosso Vineyard in Sonoma County. That opened the door for Gallo's Rancho Zabaco brand to create a line of Zinfandels and establish a Zinfandel series which, in the words of winemaker Eric Cinnamon, would demonstrate a range of Zinfandels from various appellations. "It's a huge benefit to offer opportunities to taste the different areas of Sonoma County," says Cinnamon.

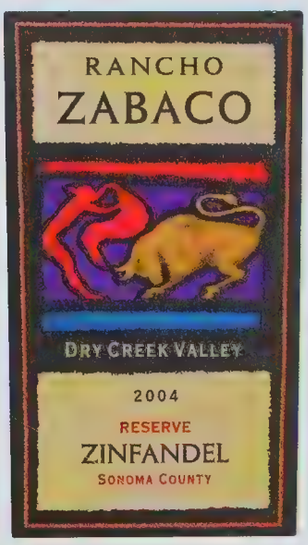
E&J Gallo has created three tiers of Rancho Zabaco Zinfandels: Sonoma Heritage Vines, an American Vineyard Appellation tier; and Russian River Valley and Dry Creek Valley, along with vineyard-specific wines.

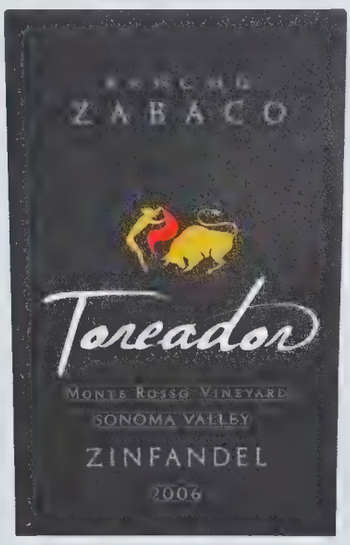
Zinfandel on VSP-trellis at Frei Ranch, a no-till vineyard with self-reseeding annual cover crop in tractor rows of Zorro Fescue, Blando Brome, and subterranean clover. Under-vine strips are maintained clean with a contact herbicide applied in mid-winter.

At the top tier is Toreador, a limited quantity wine (150 to 200 cases) made from select blocks within Monte Rosso Vineyard.

Another tier has three limited production wines — Monte Rosso and







Stefani Vineyard, both vineyard-designated wines, and Russian River Valley. On the third tier are Dry Creek Reserve and Sonoma County, both referred to by Cinnamon as "more widely distributed" wines.

TOREADOR

During a *PWV* tasting, a strong similarity between 2004 Toreador and 2004 Monte Rosso was noted. Cinnamon acknowledged that the same grapevine material (AXR-1 and St. George rootstock and Monte Rosso scion wood) is used for both and they come from 120-year-old head-pruned vines.

In describing the differences, he called Toreador "very stylistic, over the top, ultra rich," and referred to Monte Rosso as more of a "classic Zinfandel."

"Toreador has more oak impact, the white pepper becomes black pepper, and it's a little showier," he adds.

Cinnamon notes that most grapes for Toreador typically come from the Rattlesnake block of the vineyard, but added that grapes from other blocks also may be used, depending on the year. "Yield is two tons per acre, and we isolate parts of blocks in small 3.5-ton fermentors," he explains.

Cinnamon spends considerable time walking the vineyard to check maturity. "I'm looking at tannins and looking for green flavors. I don't want to bite into a grape and find it tastes like a leaf. We do hand-sorting in the field and drop fruit that is low color. The first thinning is before veraison, and we drop clusters so there are no clusters touching. We go through the vineyard one or two times after veraison."

The purchase of Louis M. Martini Winery by Gallo offers another benefit to Cinnamon.

"We put Toreador and Monte Rosso in micro-blocks through the gravity-flow Martini winery," he says. "It's nice to be able to isolate small amounts. We use a sorting table in front of the destemmer to remove rot or leaves."

Toreador grapes, harvested at about 25° to 26° Brix, are not crushed, resulting in about 70% whole berry fermentation. They are cold-soaked at about 50°F for two days, followed by fermentation that peaks at 88°F, for a total of about 12 days skin contact. For some lots, Cinnamon uses submerged cap with a daily rack-and-return.

"I'm trying to obtain texture and balance. That's why submerged cap and drain-and-return work so well for us." Drain-and-return is done four to six times during a fermentation.

A range of yeasts are used. "I like Barolo for dark fruit and also use D254 — these are my first two choices."

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The wine has a residual sugar of about 0.3g with 3.37 pH. "Sixteen percent alcohol is as high as we've gone in Toreador lots," Cinnamon notes. "We want to make a strong, powerful wine, but drinkable. If it has enough fruit, we can do anything." The 2004 vintage is 15.2%.

"MLF is inoculated after the wine is dry, and finishes in barrel. We rack after MLF is done."

The wine is aged for nine months in a combination of American (10%) and French (90%) oak. "I'm biased toward French oak and particularly new French oak for this program," Cinnamon notes. There are three or four rackings, filtration of the wine in the cellar, and then the wine is put through a membrane filter on the bottling line."

Monte Rosso

Grapes for the Monte Rosso label were picked at 25° to 26° Brix, cold-soaked for two days at 50°F and were not crushed, resulting in about 70% whole berry fermentation. Upright fermentors are used, with maximum temperatures at 85°F to 88°F. The cap is submerged with daily rack-and-return.

"We press by taste," Cinnamon says. "We use a basket press at Martini, and we get some great wine."

The wine was aged in a combination of new and used American and French oak for nine months. The 2004 vintage produced about 220 cases.

Residual sugar was 0.24 g with 3.4 pH. Alcohol was 15.2%.

Monte Rosso (Sonoma, CA)
VINEYARD DETAILS

Elevation: 1,200 feet with slopes from 5% up to 30%
Soil: red volcanic loam, iron-rich, rocky, and well-drained; fertility needs: phosphorum, boron, and zinc
Climate: average annual rainfall of 30 inches per year
Temperature extremes: 28°F and 103°F
Weather challenges: some wind storms of speeds up to 35 mph for periods of six hours during two to four nights
Rootstock: St. George, 110-R
Vine development: budbreak (late March/early April), bloom (mid-May), veraison (mid to late June), harvest (mid-September)
Drip irrigation is based on pressure chamber readings
Vine/Crop management: trellised vines are leafed on morning side, all blocks are crop thinned to yield 1.5 to four tons per acre. Head-pruned vines are spaced 8x8. Trellised vines are spaced 10x5.

Russian River Valley

Russian River Valley Zinfandel was added in 2004 to broaden the product line and comes primarily from block T06, the highest block on the MacMurray Ranch at 520 feet. The 20 acres are trellised and cane-pruned. Prior to creation of the Russian River Valley label, the fruit was designated for the Gallo of Sonoma brand.

A small amount of Dry Creek fruit is blended into the Russian River wine. For the 2004 blend, Cinnamon had 85% Russian River Valley Zinfandel, and, from Dry Creek Valley, 4% Zinfandel and 11% Petite Sirah

He prefers to use an upright fermentor for the Russian River Zinfandel. "We do pump-over and drain-and-return, with two or three returns, and no extended maceration. When it goes dry, we rack and introduce MLF."

A variety of cooperage is used — 50% old French oak, 40% new French, and 10% American.

Residual sugar was 0.26g, with 3.58 pH, and 15% alcohol. Production was 950 cases.

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Mechanical leaf removal to east side of vines at MacMurray Ranch.

MacMurray Ranch (Healdsburg, CA)
VINEYARD DETAILS

Elevation: 500 feet
Climate: region I
Vine development: budbreak (mid April), bloom (early June), veraison (mid August), harvest (late September)
Drip irrigation
Vine/Crop management: Vertical shoot-positioned vines (spaced 5x8) are leafed on morning side.

Dry Creek Reserve

Part of the Dry Creek Reserve Zinfandel comes from four blocks on the Frei Ranch, which have south and west exposure to take advantage of the hottest part of the day.

"Grapes from those blocks end up with more black fruit flavors, more spice and tannins, and more structure," says Cinnamon. Seventy percent of the property is trellised and cane-pruned with the remaining vines head-pruned.

Altogether, for Dry Creek Reserve, up to 50 tons of fruit is used from 12 blocks — half are estate and half are purchased grapes. For the 2004 vintage, 4% Petite Sirah was blended in from Dry Creek Valley.

"I like a 50-ton rotary fermentor for this one," Cinnamon says. "With the rotary, we can work the grapes harder early and then back off later. Rotaries can make wine that gives greater concentration — we're going for gusto and power. We use free run, with very little press separation, and that allows us to manage the fruit very gently."

The fruit was cold-soaked for about 30 hours at 55°F to 60°F. In the 2004 vintage, about 30% whole berries were fermented at about 88°F. After it goes dry in settling tanks, MLF is induced, then the wine is barrel-aged for 10 months. About 30% new 70-gallon cooperage is used — half French, half American — and "for the rest I'm biased toward used French oak."

Zinfandel clusters are thinned during veraison at Frei Ranch so that no two clusters are touching at harvest.

Rattlesnake block, Monte Rosso vineyard. Photo by Agustin Lammoglia.

Dry Creek Reserve Zinfandel goes through two filtrations — one in the cellar and a sterile filtration at bottling.

Residual sugar was 0.2 g with 3.75 pH and 15% alcohol. Production was 13,000 cases.

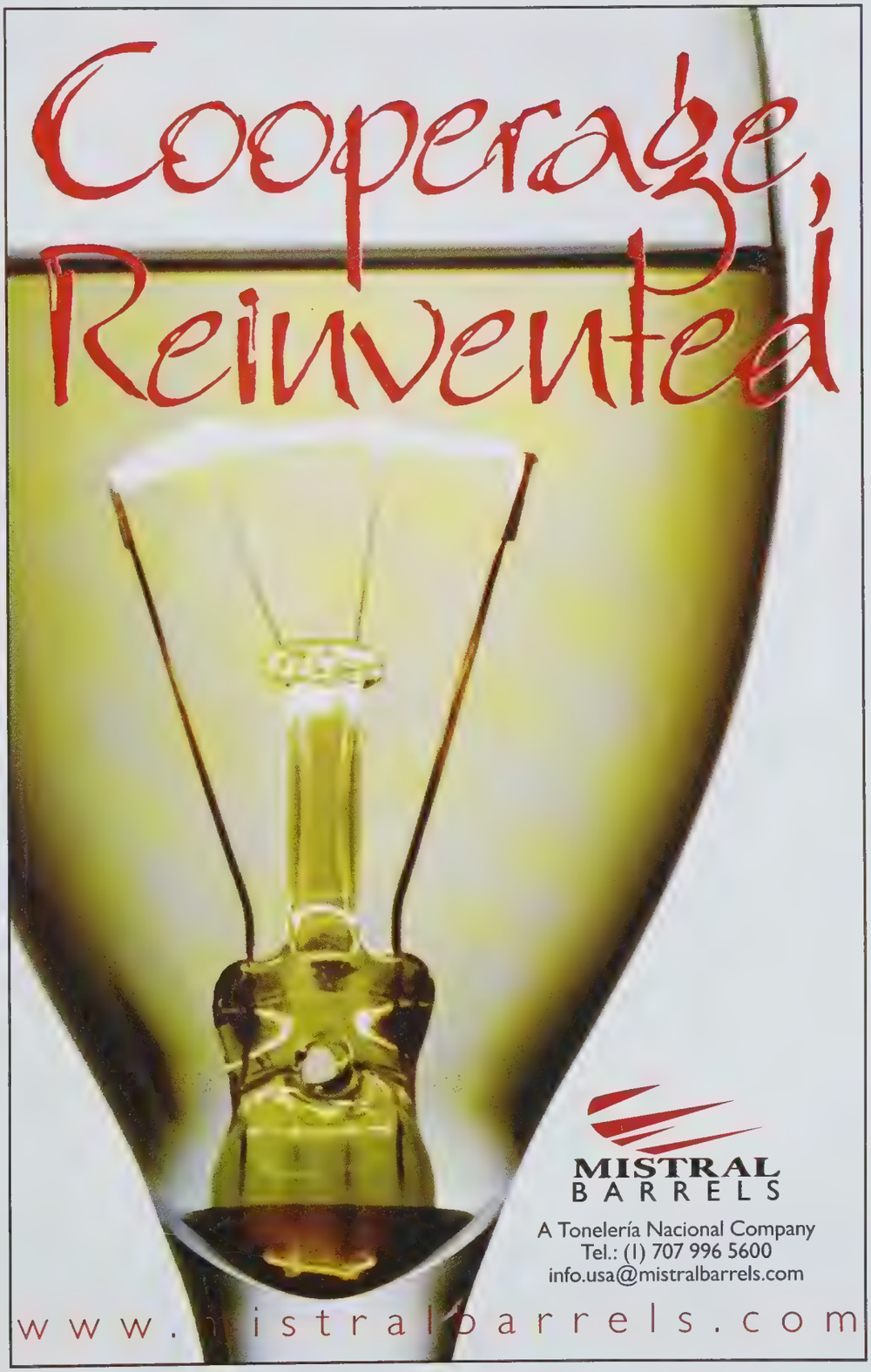
FREI RANCH (HEALDSBURG, CA)
VINEYARD DETAILS

Elevation: 200 to 400 feet with multiple aspects
Climate: region II
Vine development: budbreak (late March), bloom (late May), veraison (early August), harvest (mid September)
Drip irrigation
Vine/Crop management: Vertical shoot-positioned vines (spaced 5x8) are leafed on morning side. There is also Zinfandel on Geneva Double Curtain trellis, vines spaced 6x12.

Summary

Rancho Zabaco has created a line of Zinfandels that ranges from about $28 to $50 and offers something to suit the taste of just about every Zinfandel consumer. Winemaking techniques can vary considerably, depending on the grapes that Cinnamon has to work with and what he is aiming to achieve.

■



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QUAILS' GATE WINERY

Winegrowing in British Columbia

Boucherie Mountain Vineyard, with a southern exposure to Lake Okanagan, is the estate vineyard for Quails' Gate Estate Winery (Kelowna, British Columbia). Fourteen varieties are planted on 82 acres including: Pinot Noir (19), Chardonnay (12.5), Merlot (11), Riesling (10), Chasselas (6), Optima (4.5), Cabernet Sauvignon (4.5), Chenin Blanc (4), Pinot Blanc (4), Gewurztraminer (2), Marechal Foch (2), Sauvignon Blanc (1.65), Gamay Noir (0.91), and Cabernet Franc (0.25).

The vineyard (elevation 417 meters) contains volcanic and glacial silt that was previously planted to soft fruit orchards. The oldest vines (1961) are planted on their own roots. New plantings are on 5C, 3309, or S04 rootstocks. There are six clonal selections each of Pinot Noir and Chardonnay. All vines are on vertical shoot-positioned trellis except Marechal Foch on Geneva Double Curtain trellis.

Vine spacing was 3.05 x 2.13 meters in 1965. Higher density planings began in late 1980s. In 2005, new vines were planted 2.1 x 1.2 meters.

Average dates of vine development are: budbreak, April 20 to first week of May; bloom, middle of June; leaf removal and cluster thinning, July and August; veraison, end of August; harvest, late September into October. Harvest 2006 finished November 11 due to a warm October and large yield.

The growing degree days per year are 1100 to 1350°C with large temperature shifts day to night. The mean temperature at veraison is 28°C and 20°C day/night, while at harvest it's 20°C and 0° to 10°C day/night. The crop level is 3.0 kg per vine, with up to 19 shoots/cordon. Vines are irrigated until one week before harvest.

The home vineyard produces about 50% of the average wine production of 40,000 cases per year from 600 tons. The 2006 yield totaled 800 tons. ■

Success of Old Vines Restaurant

Old Vines Restaurant at Quails' Gate Estate Winery is one of four winery restaurants in the northern Okanagan Valley. (There are 12 winery restaurants in the Okanagan Lake area.) Lunch and dinner has been served to winery visitors for seven years, who dine while enjoying southerly views of Lake Okanagan and surrounding vineyards.

Service was expanded to year-round in 2005. There are 80 seats in the dining room and 12 seats at the wine bar. During the warmer months, from May until early October, there is outdoor seating for 40 guests on a patio surrounding the dining room.

Pinot Noir and Gewurtztraminer are the most popular wines. Wine sales at lunch are 40% of total restaurant wine sales, with 60% at dinner. Wine by-the-glass sales are 70% of total sales, with bottle sales 30%. Prices of wine by-the-glass (5-oz pour) range from $7 to $14. Bottle prices are marked up $10 to $15 above retail prices in an adjacent visitor center.

The menu changes quarterly to ensure use of the freshest seasonal ingredients and includes many entrees with wine pairings. Entrees have a recommendation of Chardonnay, Chenin Blanc, Gewurztraminer, Merlot, Pinot Noir, Riesling, or Cabernet Sauvignon.

Tasting flights offered include: Aromatic flight (Chenin Blanc, Dry Riesling, and Gewurztraminer); Chardonnay flight (2005 Limited Release, 2005 Family Reserve, and 2002 Family Reserve); Pinot Noir flight (2005 Limited Release, 2000 Limited Release, 2005 Family Reserve); and Dessert flight (2005 Riesling Icewine, 2005 BA Optima, 2002 Late Harvest Riesling).

The restaurant wait staff fluctuates from 10 people in the slow winter season to 30 in summer. Monthly wine seminars are held for staff members to ensure all employees are familiar with new releases and expand their wine knowledge. ■

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FREE RUN

Wine business leadership strategies in a global economy

BY Robert Smiley, PhD,
Professor of Management,
Director of Wine Studies,
University of California, Davis,
Timothy Keller, Research Assistant

Editor's Note: Robert Smiley and Timothy Keller conducted telephone interviews with representatives of 22 wineries, two distributors, one wine/grape broker, and one grapegrower to obtain responses to five questions about leadership strategies for the wine business in a global economy. Smiley presented his findings to the Wine Industry Financial Symposium in September, 2007 in Napa, CA.

Respondent replies to the questions are not identified. Large winery representatives include: Constellation Wines, Delicato, E&J Gallo, Fosters, Kemdall-Jackson Wine Estates, Korbel, Ste. Michelle Wine Estates, Trinchero/Sutter Home, plus six Napa Valley wineries, three Sonoma County wineries, and four other California wineries.

PWV hopes readers enjoy reviewing the responses on successful strategies.

Q. Has the run-up in demand for Pinot Noir and Pinot Gris run its course? Is there more potential demand?

• I see Pinot Grigio continuing to grow. The consumer enjoys the lightness of it. Besides being a pleasant wine, it's easy to pronounce and remember, and the consumer who goes into an Italian restaurant looking for something other than Chardonnay or Sauvignon Blanc feels very comfortable with it. In an Italian restaurant where the consumer is not certain what they want but does want white wine, they will probably order Santa Margherita Pinot Grigio — which is all one word. It's like 50 years ago when Soave came out, they would order Soave Bolla and they thought it was a wine-type. The consumer didn't know that Soave was a type and Bolla was a brand.

• If you look at Pinot Grigio, there is a real ceiling in terms of retail price — the market knows how much you can charge for it. In terms of higher-end wines, the market isn't going to grow a lot, and below $7 or so, there is probably still some growth, but I sense we are getting to the point where we are going to be in balance and probably in oversupply. It is getting into balance at the lower price-points, and at the higher price-points, we are not going to grow a lot.

• Pinot Gris growth is long-term and is not as much of a fad (it's not driven by a movie). I think it just has a natural appeal from a flavor standpoint. New World Pinot Gris are a little rounder and a little softer than Italian Pinot Grigio and it's a nice alternative to Chardonnay — it's easy to pronounce and it's going to continue to grow.

• I'm certain that Pinot Noir has more potential demand. There is no question about that. If you talk to people who love wine and you ask them what they like to drink, they tell you they love to drink Pinot Noir. You don't hear the same thing about Pinot Grigio, so I don't know that it has as many opportunities for success as Pinot Noir has.

• The Pinot Noir phenomenon happened at just the right time for California. Back in the 1970s, they planted Pinot Noir everywhere and it just didn't work in a lot of locations. There are only five or six locations where it can actually work: Russian River, Carneros, Santa Barbara, Mendocino, and parts of the Central Coast. But that's about it. Now we are starting to plant Pinot Noir in the Central Valley, there is stuff going in north of Lodi; stuff is going in all over the place because it is such a "hot" variety. I just don't believe that those locations are going to produce great tasting fruit, and when that stuff starts to come to market I will get more concerned.

• For Pinot Noir, consumers are divided into two groups: There is the high-end Pinot Noir purchaser who really knows a lot about Pinot Noir who is somewhat fanatical about it. There is the group that buys the lower-priced wines because they have heard about Pinot Noir. What I think is going to happen is that, at the higher end, you are going to see growth continuing, though there are only so many places you can plant Pinot Noir so there are going to be limitations on supply.

Q. Will global brands dominate wine in the future such as a wine version of Budweiser, or will appellation brands continue to be important?

• It is going to depend on the price-point. If it's under $10, I don't think it matters. You can put whatever appellation you want on it. As it goes up in price, people get more concerned about where it's grown, where it's from, what's the story behind it? If it's a $25 bottle of wine, people want to know where it's from, certainly from which appellation. If it's $75 to $100 per bottle they want to know what appellation, which vineyard, and the story.

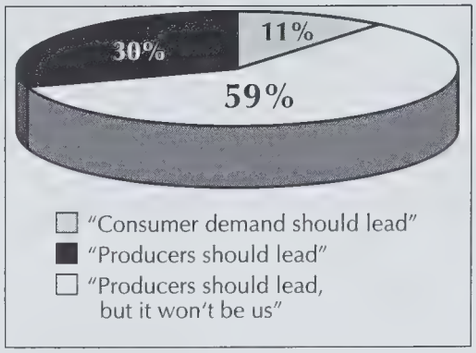
• It is a function of price-point. Below $7 per bottle, it is not that important where the grapes come from for the consumer. If there is a shortage of California Chardonnay and there is a wine at that price-point, then the producer will source the wine from Argentina, Australia or wherever. I think that global supply will be the normal course for wines in the lower price-points and I don't think the consumer is going to care.

• Appellation brands are always going to be strong and to those serious wine drinkers and collectors, it will always make a difference. The source has everything to do with the quality of the wine — it starts in the vineyard.
• We will have both and these are kind of like parallel universes. In the new world, appellation essentially is a marketing tool and a marketing trick. It has very minimal real meaning. It's a branding exercise. In the old world, appellation still has a little bit of meaning. The two are just not equivalent — they are two different animals. We call them both appellation, but they aren't really. Appellation in the old world has so much more rigor associated with it as far as farming practice, varieties, spacing, trellising — all that stuff is so proscribed. In the new world, everything goes to the point where appellation is essentially meaningless.
• We continue to see a huge amount of consumer interest in appellation and the nuance of where the wine is from. Wine still carries a huge amount of that nuance which is why the branding can be so powerful.

If that goes away, wine just becomes a commodity. If you look at the parallel industry of coffee — they have gotten more and more into appellation or origin of the beans to distinguish their coffee and to distinguish different price-points. Certainly they spend a significant amount of money on research — so there is something to it.

Q. Alternative Packaging — Should producers be leading consumers more in bringing new closures, packages, and sizes to market? Or should we wait for customer demand?

• It is really something of a funny situation, sort of like, "After you my dear Alfonse." Everyone is waiting for someone else to take the lead but few people are spearheading real change.



"I think that what we want to do on this issue is to be in the middle of the pack. We don't want to be last, and we don't want to be first."
• As consumption continues to rise — like any other beverage, or any other food product, packaging attracts new consumers. For current consumers, new packaging potentially provides an additional benefit — it's easier to store and use, to picnic with, etc. Yes, the producer has to continue to innovate.

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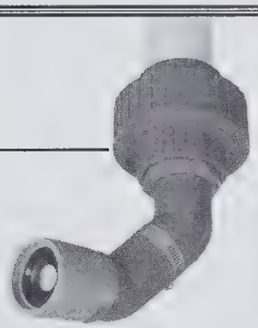

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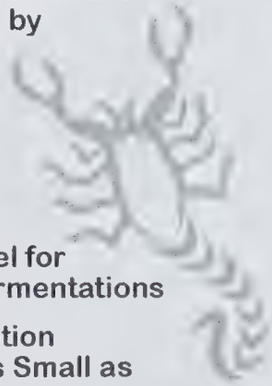

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• It depends on the wine. We are now putting screwcaps on our Sauvignon Blanc that is going to be consumed within a year of release, and it seems to be a trend that is here to stay. New Zealand is leading the pack and consumers like the ease and simplicity of it. Women particularly enjoy taking the corkscrew away from men and allowing themselves to just pop the top.

• The widespread industry acceptance of the Stelvin wine closure has radically transformed the image and appearance of screwcap wines. The screwcap has gained traction and popularity in both Australia and New Zealand among high-end white and red wines. Despite some resistance from sommeliers and wine retailers (what are we going to sniff?), it is clear that, for white wines, the screwcap has earned a permanent place in the wine cellar and on the table.

• We are doing some research on screwcaps. I don't think they bring anything more to the party than synthetic closures do, frankly. Some people think they are easier to open but I have seen myself and waiters struggle with screwcaps.

• We believe traditional cork suppliers have become much more aggressive, responsive, and attuned to our needs and complaints. We are really speaking with a louder voice about cork quality issues and are being responded to. I think cork quality is increasing.

• We need to have options that are consumer-driven. There are many consumers that want alternative packaging, particularly things like screwcap or the higher quality bag-in-box. It enables them to minimize waste, sustain wine quality, and it simplifies serving for them. I think that when you get a consumer-driven trend like screwcap or bag-in-box, the industry needs to provide that and it becomes a point of differentiation.

Q. What do you think the future of all-ingredient labeling will be, and what should it be?

• I know there is a lot of concern in the wine industry that neo-prohibitionists are driving this.

• If there are issues of serious allergic reaction or potentially avoided-type full disclosure, that is one thing — but I don't think that is what we are talking about.

RS: What are we talking about?

I think they want to control alcoholic beverages.

• Ingredient labeling should be limited to "Contains Sulfites" and "May Contain Allergens." All other ingredients in a bottle of wine change with every bottling. If wineries are expected to change labels constantly, the cost could be prohibitive and put some wineries out of business.

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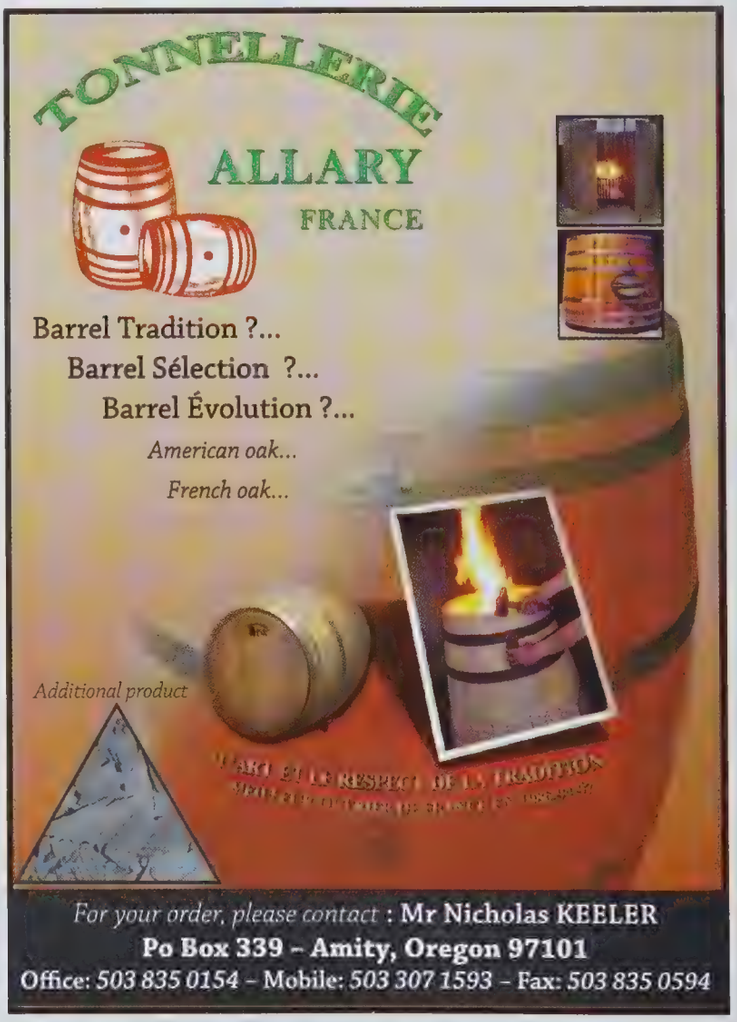
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Wine Grape Varieties in California
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Wine Grower's Guide
Philip M. Wagner
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Winery Utilities Planning, Design, and Operation David Storm
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Winery Wastewater Handbook: Production, Impacts, and Management
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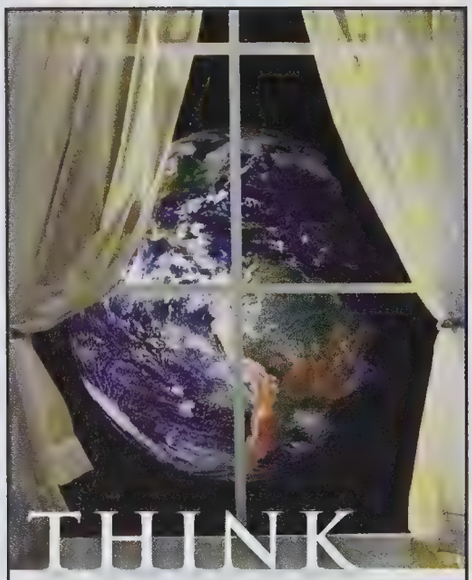
Examines the chemical nature of wastewater, its impacts, how it can be handled efficiently, and disposed of responsibly. **128pp—$25.00**

that deep into what is in the bottle. They talk about the taste, appellation, history, name, family — and that's what I love to talk about in wine. They aren't interested in talking about the specifics.

- It is a consumer-matter, and what do they really want to know. If we think there are definitely components in a bottle of wine that the consumer should be aware of, we should tell them. But I would take a poll and see what consumers really want to know. I talk to a lot of consumers about the products that they consume and, like myself, they are mostly concerned with carbs and calories.
- A lot of negotiation has to go on between government and the wine industry as to how they are going to handle this because I think it's already been passed into law and now they just have to determine the regulations. People were looking at a lot of other products besides wine when they signed that legislation and now wine is caught up in a broader legislative package.
- Our country and our consumers are overwhelmed with all this labeling crap. I don't believe that people read all this stuff. A lot of this is because we have some groups that have been active politically and have spent some money to obtain some of these things on ingredient labeling. Some of these groups would want ingredient labeling on everything that you pick up in the U.S.
- What happens when you put wine in a barrel? Should you list what gets leached out of the oak? When you use yeast in a wine, there are things that are leached out of the yeast... Where do you draw the line on that? I think it is more complicated than a lot of consumer products, and frankly I don't think it is necessary. I don't know — I hope not.
- We talked to a supermarket chain buyer about the popularity of organic foods in general and I asked, "What about organic wine?" He replied,



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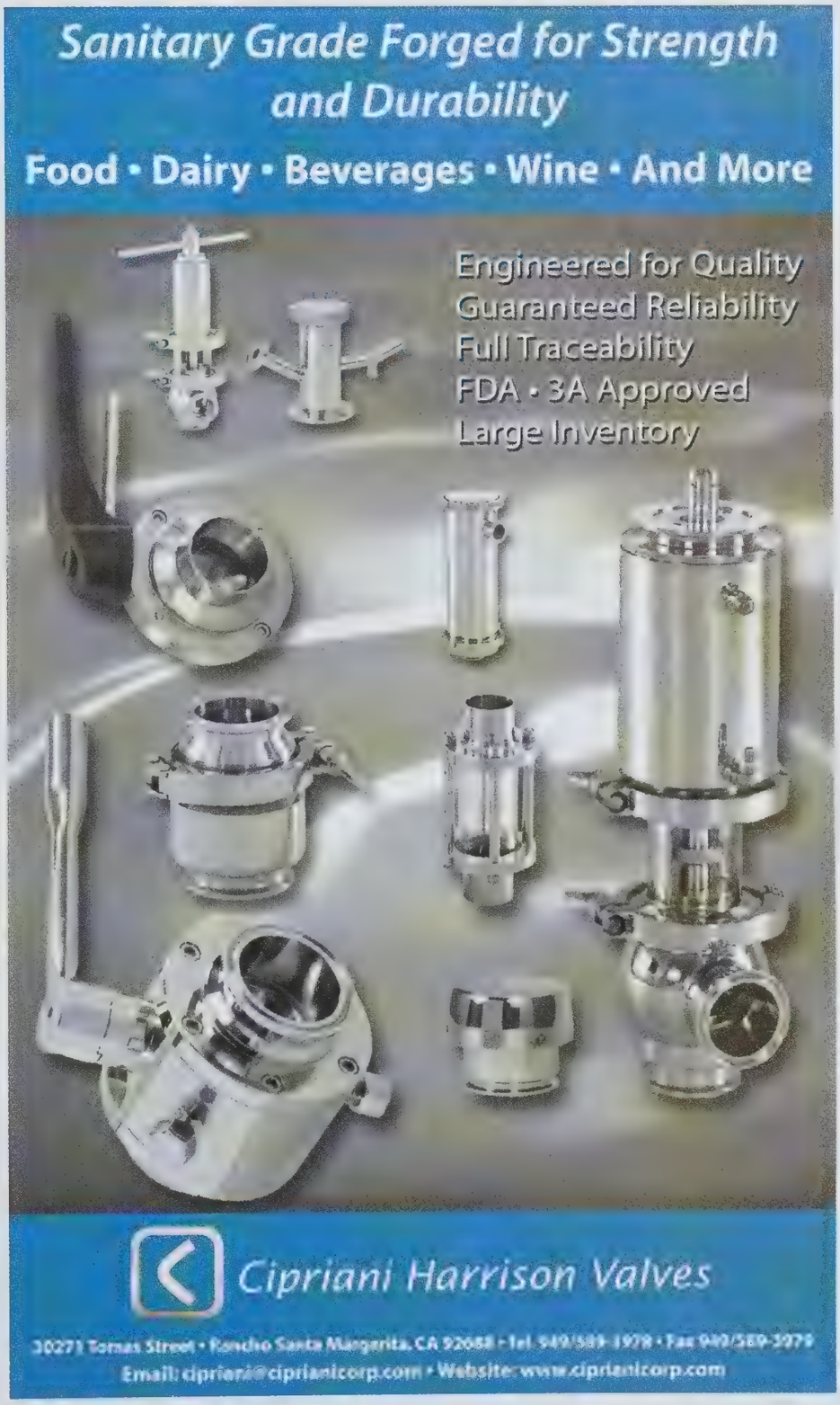
WHERE THE INDUSTRY AND INFORMATION CONNECT

"Consumers already think wine is organic," so you don't have to worry about that with wine. There is a purity of image that we need to maintain. The bottom line is that we add virtually nothing to wine anyway. It is not something I would push.

- The industry needs to respond with one voice so that this is not something that descends into the chaos of every producer having a different opinion. We are working closely within the Wine Institute to speak with one voice so that the information on the label helps the consumer make an informed choice with meaningful information.
- We should present information that is consumer-relevant and meaningful. Right now we are debating what advocacy groups want on the label. We need to ask, "What does the consumer need to know?" and put THAT on the label.

Q. What will we be talking about in 5 to 10 years that we are not talking about now?

- Sustainability and economic viability of being able to grow premium wine grapes in California.
- We are going to be talking a lot about climate change and global warming. "How do we manage our industry from a carbon standpoint and how do we reduce the CO_2, because we produce CO_2."
- We are going to be talking a lot about resource management. Environmental issues are going to be a big deal for business in general, and everyone is going to have to deal with it. For example, we use bottles — bottles are heavy. Bottles are expensive to ship, and it takes a lot of energy to make a glass bottle. We are going to have to deal with that at some point in time. We ship wine long distances and that's expensive. We should probably be more focused on local markets.
- Direct sales is going to become a bigger deal. Distributors are becoming very powerful, as we know, but at the same time, there is a lot of expense in the system and you have to believe that somebody is going to figure out a model where wineries can ship directly to retailers and cut out that extra 25% that it costs us at the distributor.
- Asia is going to be a huge opening for the world — and I think it's going to take at least 10 years for the world to figure that thing out. An increasing customer base is going to emerge.
- I am concerned with California's ability to compete, with our high cost of doing business. Generally speaking, we have to be near the top.
- The key to being really successful is to be behind the demand curve, because every winery that gets ahead of it, the retail trade knows it, and you have to push it, then you're price-discounting and you destroy value very quickly. It can turn on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you in a very short time-period. The really successful wineries that I've seen have given up some growth opportunities so that they can take pricing up and can achieve better margins. They are the ones who are the most successful — that is really the key for success in the wine business.

• One thing the industry is having a hard time with is glass bottle supply. What are we going to do about that as an industry?

• In five years, we are going to be wondering why we can't get more vineyards planted, because we will be in short supply.

• Demand continues to grow in the 4% to 5% range. In four to five years, that's 20% to 25% more volume. There is just not enough vineyard land and people putting vineyard into production. It has been so brutal, and tough on growers for the last five years. It's been one of the worst downturns we've seen in some time. The cost of planting a vineyard has gone up about 50% since the year 2000, just for steel, stakes, and wire. The cost of planting a vineyard has just exploded. ■

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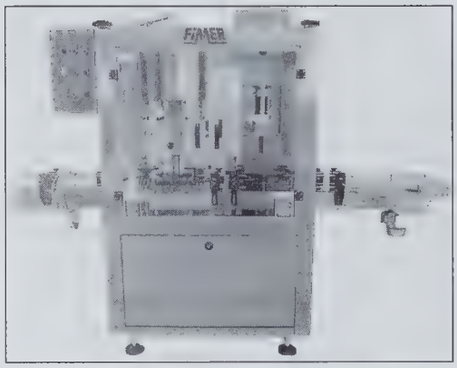

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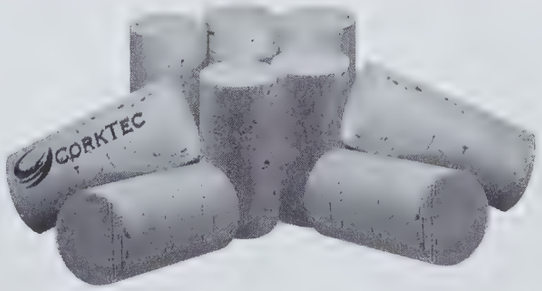

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– PROPOSED PROGRAM –

General Sessions

Jan. 29 9 AM **A world of wine issues** — Peter Hayes (President, OIV, Australia).

Three key decisions to position your brand for the future — To help wineries, vineyards, and associations define and execute marketing strategy. The panel will discuss: a) Understanding and defining your consumer segments, b) Building your brands to meet their needs, c) Establishing relationships with consumers through a variety of channels.

Jan. 30 8:30 AM **State of the industry** — First glimpse at the 2007 wine market and what's in store for 2008. Joshua Green (*Wine & Spirits Magazine,* NY); Glenn Proctor (Joseph W. Ciatti Co.); Nat DiBuduo (Allied Grape Growers, CA); Jon Fredrikson (The Gomberg Fredrikson Report).

Jan. 31 9 AM **Major trends to factor into business decision-making** — Understanding the sales numbers on a global basis to culinary trends and the greening of business. Barbara Insel, (MKF Research); Cal Dooley (Grocer Manufacturers of America/Food Products of America, Washington, DC); Mark Erickson (Culinary Institute of America, NY); Clay Gregory (Jackson Family Estates, CA).

Grape Growing Sessions

Jan. 29 1:30 PM **Research Update** — Novel method for continuous crop monitoring and yield estimation, Julie Tarara (USDA ARS, WA); Review of Pierce's disease funded research – focus for the future, Roger Innes (Univ. of Indiana); New Pierce's disease findings, (Steve Lindow, UC Berkeley, CA).

2:45 PM **Research Update** — Development, testing, and introduction of grape rootstocks (broad and durable), Andy Walker, (UC Davis); Impacts of in-row vineyard floor management practices on multiple aspects of wine grape production, Larry Bettiga (UC Coop Extension); Leafroll spread, Deborah Golino (Foundation Plant Services, UC Davis); Effects of cluster temperature on composition of berries, Jim Kennedy (Oregon State Univ., OR).

Jan. 30 2 PM **Changing Water Issues** — Drought, changing environmental regulations, and impacts of climate change on water availability and quality, annual "water budgets," implications for soil health and winegrape quality from changing technology, and irrigation practices, Mike McCarthy (Viticulture Research Group, South Australia R&D Institute).

Jan. 31 2 PM **Invasive Pests: What now? Part I:** Overview of risk assessment process and border protection programs to prevent introduction of invasive pests, diseases and weeds; ability of government and private sectors to respond rapidly to infestation, Michael Guidicipietro, (U.S. Dept. of Agriculture, Washington, DC); Tom Winkowski (U.S. Dept. of Homeland Security, Washington, DC); Robert Wynn (CA Dept. of Food & Agriculture). **Part II:** Impact of invasive pests, current eradication, and control programs for new and emerging invasive species, including Light Brown Apple Moth, Vine Mealybug, and weeds, Ernest Delfosse (USDA ARS, Washington, DC); Frank Zalom (UC Davis); Kent Daane (UC Berkeley).

Winemaking Sessions

Jan. 29 1:30 PM **Research Update** — Oxidation of wine, control for quality, Andy Waterhouse (UC Davis); Analysis of sulfide off-odors

Continued on page 81

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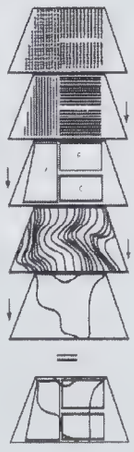

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ROEDERER ESTATE

Harvesting consistent quality from reserve wines matured in oak casks

BY Millie Howie

Oak casks play a critical role in sparkling wine production at Roederer Estate in Mendocino County's Anderson Valley (Philo, CA). The casks hold Roederer's reserve wines — selected from the best wines of each vintage. A percentage of the reserve wine is added to each of Roederer's four sparkling wine blends.

The 2007 purchase of ten 65-hectoliter (hL) casks (see photo page 65) from Seguin Moreau Napa Cooperage brings the winery total to 64. Roederer first purchased five casks in 1985.

Forty-four of the winery's casks are 45hL (about 990 gallons), and 20 are 65hL (about 1,430 gallons). The size of the casks is restricted by the size of the shipping containers in which they are delivered from France, where they are made.

The winery's total reserve wine storage capacity is 3,280hL (about 72,150 gallons).

"The casks are the best way to keep fermented wine on fine yeast lees for an extended time without picking up with too much oak flavor," explains Amaud Weyrich, vice president-production. Roederer is striving for scarcely detectable oak flavor. "Barrels provide too rapid oxygenation. Casks allow the wine to stay in oak with slow oxygenation, also called micro-oxygenation," he says.

Roederer produces about 95,000 cases of sparkling wine — Brut NV and Brut Rosé NV every year, but in exceptional years, also L'Ermitage and, even more rarely, L'Ermitage Rosé. The L'Ermitage blends are the winery's tete de cuvees and receive a vintage designation.

About 10% of the non-vintage sparkling wine blends come from the reserve wine program, "which gives us consistency and helps maintain the company style (since the wine is non-vintage)," Weyrich describes. The maximum amount of reserve wine blended into the vintage L'Ermitage blends is 3%. The wine fraction used for the dosage is a special selection of reserve wine, also from the casks.

"About 850hL of reserve wine is used in the non-vintage Brut and Rosé per year," says Weyrich. "We always replace what we remove from the casks with wine from the current harvest."

"The Roederer style is not to bring too much oak influence to the wine. In the first two or three years of use of a new cask, the wine spends only a few months in wood. It takes two rotations of fermenting fresh must in the new casks ('culottage') before they are ready to hold reserve wine for an extended period of time. After that, the wine can mature in the casks for two to six years."

A cask has a life span of 40 years. Unlike barrels, which are toasted, the casks must be neutral, so their staves are not toasted but may be fire-bent or steam-bent. "You want the casks to be similar to each other in oak profile," explains Weyrich. The staves are 2½-inches thick. Choice of cooper brings a little difference in style. Roederer's casks have been built by two coopers: Seguin Moreau and Tonnellerie Radoux.

"Selecting a cask is quite empirical," Weyrich has found. "It is not a textbook move. The more choices you have available, the better off you are. Unlike barrels, which are often shaved to expose fresh wood, it is not a good idea to shave a cask. When you expose the wine to fresh wood, you get too much tannin extraction during extended ageing." ■

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SUPPLIER SHOWCASE

Oak Cooperage

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Artisan Barrels

Since 1997, Artisan Barrels offers winemakers a one-stop shop for well-constructed barrels from several Artisan coopers. Whether in Burgundy, Bordeaux, Cognac, Missouri, or Hungary, they all craft consistently high-quality barrels.

Rousseau, the Burgundy cooperage, offers the *Piano* and *Allegro* barrels for 2008, where proprietary toasting and forest selection are aimed at shorter aged whites or reds. Rousseau open-top fermenters, maturation tanks, and round/oval casks should be available, if ordered before Spring 2008. New stainless steel accessories are available: cooling panels, a thermowell, and one-meter top hatch.

Saint-Martin will market Central European oak with a blend of Slovakia, German, and Russian oak in 2008. Saint-Martin continues to offer 15- and 30-gallon French and American oak barrels for home winemakers or small wineries (split lots and/or topping wine).

Allary, Rousseau, St-Martin, and Balazs puncheons and hogsheads are recommended for wines requiring minimal oak extraction and a gentle oak exchange.

A&K Cooperage offers winemakers a Missouri oak price-sensible solution to gracefully age varietals such as Zinfandel, Cabernet, Merlot, or Petite Sirah.

Balázs barrels, built in Hungary with dependable craftsmanship, will be distributed exclusively by Artisan Barrels in California, Oregon, and Washington (24 and 36-month air-dried oak is available in 112L, 225L, 300L, and 400L).

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PLEASE SEE ARTISAN BARRELS AD, PAGE 17.

Barrel Builders

Barrel Builders is the exclusive distributor for **Tonnellerie Marchive** barrels (France), **Budapesti Kadar** barrels (Hungary), and **East Bernstadt Cooperage (EBC)** barrels from Kentucky.

Budapesti Kadar (BK) has been crafting barrels in Hungary for more than 50 years exclusively using wood from the fabled Zemplen forest in the Carpathian Mountains. Long the pre-eminent cooperage in Central Europe, BK has become a mainstay of premium wine programs in wineries around the world.

Tonnellerie Marchive still uses a long, slow toasting process that they pioneered in Jarnac some 60 years ago. Marchive is situated in the province of Bordeaux, between the vineyards of Medoc and Cognac, a short distance from areas that produce some of the best French oaks of Allier, Nevers, and Troncais.

East Bernstadt Cooperage (EBC) builds barrels for Barrel Builders from three-year air-dried Quercus alba sourced in the Daniel Boone National Forest in the heart of the Appalachian Mountains.

Barrel Builders offers a full range of French (Quercus robur) and American (Quercus alba) oak chips. Both are a medium-size chip with a medium or medium-plus toast.

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PLEASE SEE BARREL BUILDERS AD, PAGE 25.

The Barrel Mill

Since 2000, The Barrel Mill has been supplying winemakers in North America with premium oak wine barrels, made from fine Northern White oak.

They are also a leader in barrel alternatives. The patent-pending Infusion Spiral, unique in the industry, is a perfectly toasted barrel alternative that gives winemakers a wine with excellent taste and aroma, while saving time and the bottom line. The unique process of cutting and toasting the spirals assures even flavor distribution throughout the wood, providing predictable winemaking results. The spirals can fully flavor wine in a barrel, a carboy, or a tank in six weeks.

Infusion Spirals are available in both American and French oak, in light, medium, medium-plus, and heavy (lengths of 8 inches, 9 inches, or 48 inches).

The Barrel Mill offers premium American White oak barrels in 5-, 10-, 15-, 30-, and 60-gallon sizes.

Oak for barrels and Infusion Spirals is inspected both before and after cutting, and is selected on many criteria, including growing location and conditions. These factors determine the textural variety of wood fibers, the fineness of its grain and its tannin content, resulting in excellent oak winemaking products. Barrel Mill's commitment to quality and consistency is evident in every barrel and Infusion Spiral.

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PLEASE SEE BARREL MILL AD, PAGE 36.

Canton Cooperage

"American Tradition, French Know-How" perfectly describes the philosophy of barrel making at Canton Cooperage. As part of the Chene & Cie group of fine coopers (along with Taransaud and Jacques Garnier), Canton Cooperage combines the best of American and French coopering techniques in the production of premium American oak barrels.

Canton Cooperage (Lebanon, KY), is in the heart of the Appalachian hardwood forest. Proximity to high-quality white oak allows Canton to select the very best wood. The atmospheric conditions of central Kentucky are ideal for open air-seasoning of this oak (the origin and aging of all Canton oak is certified by the international certification agency Bureau Veritas).

Barrel toasting, another key to quality coopering, is done according to time-tested French techniques combined with the most modern temperature control technology.

Winemakers may choose from two product lines of Canton Cooperage barrels. Canton's GRAND CRU barrel is made from extra-fine grain, 36- or 48-month American oak and is notable for subtle sweetness and spice. The Canton VINTAGE barrel is made from American oak (air-dried for a minimum of 24 months), and features distinctive vanilla, caramel, and almond characters.

All Canton barrels are available in 225-, 228-, or 265-liter capacity.

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Demptos Napa Cooperage

You don't have to be an enological Rip Van Winkle to have missed the dramatic developments at Demptos! During 16 years of Francois family ownership, the Bordeaux cooperage was modernized and new cooperages constructed in Napa, CA, Szigetvar, Hungary, and Logrono, Spain. Demptos Cooperages uses its oak selections to produce world-class French, American, and Hungarian oak barrels for some of the world's finest wines.

Demptos selects tight-grain American white oak from heavy clay and gravel soils within a 50-square-mile area in southern Missouri. Following natural air drying and seasoning for 24 to 36 months, the staves and headwood are sweet and ready for coopering into 228L Burgundy and 225L Bordeaux Export-style barrels. Traditional oak-fire bending and toasting (minimum of 50 minutes) allow complete development of toasty, sweet oak flavors in the finished barrels.

Backed by the Demptos research department, Demptos coopers French, American and Hungarian oak barrels in Burgundy and Bordeaux styles, and custom oak tanks. 10 forest selections and 12 barrel styles promise the best barrels to complement your wine.

Visit Demptos Napa Cooperage for a complete tour and barrel seminar. The staff, including Will Jamieson, Mark Heinemann, Julie Guffy, and Tom Payette, look forward to working with you in 2008!

For more information, contact:
Demptos Napa Cooperage
1050 Soscol Ferry Rd., Napa, CA 94558
tel: 707/257-2628; fax: 707/257-1622
e-mail: info@demptosusa.com
website: www.demptosusa.com

PLEASE SEE DEMPTOS COOPERAGE AD, PAGE 23.

Tonnellerie Jacques Garnier

The ALTO barrel from Tonnellerie Jacques Garnier sets a new standard for quality in European oak cooperage. Working closely with sister cooperage Taransaud, Jacques Garnier has designed this exceptional barrel, which defines the unique contribution that central European oak can make to fine wines. The ALTO barrel is the perfect choice for wines requiring subtle sweetness, elegant structure, and bright spice.

All central European oak used in the ALTO barrel is hand-selected for consistency, grain tightness, and a blemish-free appearance. The oak is naturally air-seasoned and carefully fire-toasted, employing both traditional European methods, and the most modern temperature control.

As a member of the Chene & Cie family of fine coopers (along with Taransaud and Canton Cooperage), Tonnellerie Jacques Garnier offers the most comprehensive traceability and quality control guarantees available.

Jacques Garnier's ALTO barrel is available in 225-liter or 228-liter capacity. Larger format cooperage and thin-stave versions are available upon request.

For more information contact:
Tonnellerie Jacques Garnier
5803 Skylane Blvd. Ste. C
Windsor, CA 95492
tel: 707/836-9742; fax: 707/836-9759
website: www.jacquesgarnier.com

The Boswell Company

The Boswell Company provides specialized barrels from Tonnellerie de **MERCUREY** in Burgundy and Tonnellerie Jean-Louis **BOSSUET** in Cognac. These coopers operate with great integrity.

These are classic, personalized family-owned workshops. Oak sourcing, stave selection, and seasoning are fully controlled. Both owners are forest experts who purchase French oak directly at government auctions.

Tonnellerie de MERCUREY is a Burgundy cooperage for Pinot Noir, Chardonnay, and Syrah. Nicolas Tarteret (owner), grew up in a family of oak negotiants in Champagne. De MERCUREY sources and splits all their French oak staves and heading. This integrated sourcing is unique among Burgundy coopers. Proprietary long toasts are done with low intensity heat and continuous water treatments.

Tonnellerie Jean-Louis BOSSUET barrels are used for Merlot, Cabernet Franc, Cabernet Sauvignon, and Sauvignon Blanc. Mr. Bossuet personally selects French oak from ancient trees near the Loire Valley. Logs are split on the premises with the stave seasoning accomplished in well ventilated chimney style stacks. Every barrel is made from start to finish by an individual cooper. This is craftsman level versus industrial style.

With more than 30 years of cooperage experience, The Boswell Company offers new French oak wine barrels with personality and consistent quality. You should find doing business with our staff economically attractive, easy, and pleasant.

For more information, contact:
The Boswell Company
1000 Fourth St., # 640, San Rafael, CA 94901
tel: 415/457-3955; fax: 415/457-0304
website: www.boswellcompany.com
PLEASE SEE BOSWELL COMPANY AD, PAGE 14.

Mistral Barrels, Inc.

Mistral Barrels introduces the Odyse convection-toasted barrel. Developed by Toneleria Nacional, the parent company of Mistral Barrels, the Odyse convection-toasted barrel has generated a revolution in the creation of premium wines. Building on 10 years of experience worldwide, they have refined and adapted the convection-toasting process to create a barrel with unprecedented toasting penetration, with total control over a barrel's aromatic and sensory characteristics.

The proprietary software that controls the custom-built convection oven monitors temperature, time, and toasting penetration. With a variety of toasting recipes, they can create a precise flavor profile that is truly repeatable in every barrel.

Toneleria Nacional is committed to research and development that is evaluated and scientifically certified by the most prestigious international research institutes in the industry. Please visit www.mistralbarrels.com to review the latest findings. Mistral Barrels also offers traditional fire-toasted barrels in the Chauffe à Coeur method, and a full line of barrel alternatives.

For more information, contact:
Mistral Barrels, Inc.
Ken Seymour
143 E. Napa St., Sonoma, CA 94558
tel: 707/996-5600; fax: 707/996-4996
e-mail: info.usa@mistralbarrels.com
website: www.mistralbarrels.com
PLEASE SEE MISTRAL BARRELS AD, PAGE 51.

Mercier USA

From forest to your cellar, quality control is a priority. Mercier owns their own mill, which, combined with new buildings and modern machinery, ensures consistent and repeatable quality. Each barrel is coded to certify wood, air-drying time, and all manufacturing details. When you ask for the same barrel as last year, Mercier can deliver.

Frederic Mercier (master cooper) uses oak obtained exclusively from French forests that have proven to be consistent, continuous sources of premium oak. Available barrels include: 225L Bordeaux with 27mm or 22mm staves, Chateau Ferre, or the Tradition with chestnut hoops, and 228L Burgundy barrels are offered in the Export style or Tradition.

Ask about the new "Delicate" toast for your Chardonnay and Pinot Noir. Mercier also offers 500L puncheons.

Mercier's team of experienced winemakers provides knowledgeable help to fine-tune your barrel choices. Before your next order, call Mercier. Mercier experts will help you create your favorite barrels, glass in hand, in the cellar. Melinda Elledge, previously with Ramondin USA for 17 years, has joined the Mercier team in sales, marketing, and customer service.

For more information, contact:
Mercier USA, Inc.
PO Box 2267, Napa, CA 94558
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Melinda Elledge
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e-mail: melinda@mercierusa.com
web: www.mercierusa.com
PLEASE SEE MERCIER USA AD, PAGE 52.

Mistral/Barrel Alternatives

Introducing the "Mistral Barrel insert," that will allow fruit to stand-out while complex toasted oak flavors and aromas enhance wine. Mistral Barrels, one of the leaders in the barrel alternative market, produces a full line of barrel alternatives for today's winemaker that offer economical value without scarifying quality.

Tech Stave and Mini Stave systems for stainless steel tanks are a leader in the premium oak segment. These systems offer an economical way to achieve barrel-like finesse with outstanding results.

ViniBlock flexible infusion bags are filled with blocks or cubes of the finest quality oak, naturally air-dried for 24 to 36 months, and convection-toasted in four different levels (light to heavy toast). The flexible ViniBlock bags can be inserted into any type of tank system, independent of shape or capacity.

OakVin is an economical product that comes in two different forms: chips and powder. The principal advantages of OakVin are ease of use, generating the desired characteristics in wines, and taking only weeks to make its presence noticed.

Zig-Zag: A barrel rejuvenating system designed to extend the productive lifecycle of barrels. The Zig-Zag System is easily inserted into a wine barrel through the bunghole, eliminating the expensive need for barrel inserts.

For more information, contact:
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website: www.mistralbarrels.com

PLEASE SEE MISTRAL BARRELS AD, PAGE 51.

Oak Solutions Group

ēvOAK by Oak Solutions Group continues its obsessive attention to winemaker needs and commitment to creative technology. Newly released products include Pure², Cuvee Nº 1, and Cuvee Nº 2 tank staves.

Pure² is robust vanilla. Unlike its predecessor, the "High Vanilla" tank stave that delivers multidimensional characters with prominent vanilla, the second generation Pure² is intense vanilla and low tannin.

Using expertise and research in the field of oak, ēvOAK has developed two new tank staves for its Cuvee Series. Each "cuvee" or blend is formulated with certain flavor characteristics in mind to help winemakers craft wines that are truly great.

Cuvee Nº 1 is a tank stave with unmistakable macaroon flavor. Nº 1 has qualities of toasted coconut, phyllo dough aromas, almond biscotti, toasted almonds, and hazelnut with a taste of honeysuckle. Cuvee Nº 2 provides impressions of toasted marshmallow, vanilla crème, classic crème brûlée, and nougat.

ēvOAK's new Artisan toasting brings you Flavor by Design, High-Extract Oak Chips. ēvOAK has custom-designed a small batch toasting oven to produce the highest-quality, singular flavor chips that are convenient to use. Each batch is carefully heated in a small rotating drum to develop specific attributes in the oak before release onto a cooling tray. With limited production, full-flavor toasts available include High Toast, High Spice, High Mocha, and Pure² High Vanilla.

For more information, contact:
Oak Solutions Group
Paul Abbott, Oak Solutions Specialist
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Napa, CA 94558
tel: 707/259-4988; fax: 707/255-5952
e-mail: pabbott@oaksolutionsgroup.com
website: www.oaksolutionsgroup.com

Oenodev

OENODEV, the inventors of micro-oxygenation, have been a leading company in innovations for winemaking for more than 15 years.

Oenodev's "BOISE FRANCE" brand oak chips give winemakers choice and control of a key element of the maturation process — the oak component. Today, Oenodev is a well-respected premium oak supplier with offices in Europe, the Americas, and Australia.

In recent years, the wine industry has an increased understanding of the reactions during traditional wine maturation. Micro-oxygenation has proven a viable alternative to traditional oak barrel maturation. What used to happen by chance now can be fully controlled.

The Boisé France range of oak chips has been developed to give more control to the winemaking process. Eight different selections deliver specific characteristics to wines:

- Sweetness;
- Fruit expression enhancement;
- Structure and body;
- Complexity;
- Specific aromatic adjustment.

Using top-grade oak chips gives winemakers freedom and flexibility to produce desired wines, without compromising wine quality. High-quality oak chips assures reproducible results; an ability to correct wine properties; with lower cost than barrels and staves.

It is the smart way to produce high-quality wines and still optimize your oak budget.

For more information, contact:
Oenodev USA
1260, N. Dutton Ave. #240
Santa Rosa, CA 95401
tel: 707-332-1078; fax: 707-542-6364
website: www.oenodev.com;
www.boisefrance.com

PLEASE SEE OENODEV USA AD, PAGE 35.

Keystone Cooperage

Keystone Cooperage, located in southwestern Pennsylvania, is a producer of premium wine barrels ranging in size from 225L to 500L. Keystone Cooperage sources oak from the best white oak Pennsylvania has to offer. By personally inspecting each log, Keystone Cooperage insures that you get the best oak possible.

Winemakers have the ability to broaden their "spice rack" with a selection of either 24- or 36-month air-seasoned normal- or tight-grain oak, and choice of water- or fire-bending. Toast levels offered range from light to heavy toast. Keystone Cooperage puts the most emphasis on toasting being specific to the customer.

In addition to American oak barrels, Keystone Cooperage offers French oak barrels sourced from Allier and Never forests. Seasoned in the U.S. and coopered by Keystone Cooperage, you are sure to receive the best French oak barrel possible.

For more information, contact:
Keystone Cooperage
tel: 724/883-4952 ext. 24 or ext. 27.
e-mail: wilsonfp@alltel.net
website: www.keystonecooperage.com
PLEASE SEE KEYSTONE COOPERAGE AD, PAGE 21.

Knox Industries

Mel Knox represents two of the best cooperages in the world, Tonnellerie Taransaud and Tonnellerie Freres.

Tonnellerie Taransaud (Merpins, France) supplies many kinds of barrels to the greatest wine estates in the world. The Taransaud secret is two-fold: excellent stock of naturally air-dried wood (all age-certified by Bureau Veritas) and great attention to detail. For example, a thermocouple measures the temperature of barrels when toasting. Time and temperature are closely monitored, so there are no surprises.

Besides making 225-liter barrels, Taransaud offers 350-liter, 500-liter, and 600-liter barrels, plus tanks, round casks, and ovals.

In the past 10 years, Taransaud has installed many oak tanks, ovals, and round casks in Oregon and California, including 56 tanks for the To-Kalon Room at Robert Mondavi Winery, 12 tanks for Niebaum-Coppola, and many special tanks at Harlan Estate. Tanks at Harlan and Niebaum-Coppola/Rubicon have stainless steel tops with a removable inner cap that are ideal for fermentation and/or storage.

Tonnellerie Francois Freres is respected for its work with top domaines in Burgundy, California, and the world. Both Burgundy and Bordeaux-shape barrels are available. In 1999, the Francois Freres group bought 50% interest in Trust International, a producer of Hungarian oak barrels. As the species of oak found in Hungary are the same as those in France, barrels resulting from this alliance have been of great interest to winemakers. The results of the Francois investment have been excellent, yet well-priced barrels that are allocated.

For more information, contact:
Mel Knox, Knox Industries
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tel: 415/751-6306; fax: 415/221-5873
e-mail: admin@knoxbarrels.com
website: www.knoxbarrels.com

O.C., Inc.

Believing that there is no substitute for experience, O.C., Inc. provides the highest-quality toasted oak chips and barrel alternatives available. Natural extracts from these oak alternatives contribute to an improved bouquet and flavor of wine and spirits.

The batch-processed toasted oak chips and barrel alternatives are produced from the finest white oak in North America and France. The timber used is not a by-product of other processes, but is specially selected for O.C., Inc. products. The same timber is utilized and exported worldwide as cooperage material to produce barrels for aging of superb quality wines and spirits. A unique "slow-roasting" process ensures the most consistent barrel alternatives.

In order to provide customers the opportunity to choose the best and most appropriate barrel alternative for their desired application, O.C., Inc. offers a wide variety of products in American or French oak: Oak chips and powder, oak cubes, tank staves, barrel inserts, oak segments, oak-flavoring sticks, oak shavings, oak nuggets, VSOP, and NU-OAK. Inspect the O.C., Inc. catalog at www.oakchipsinc.com.

For more information contact:
O.C., Inc.
191 Seif Road, Piketon, OH 45661
tel: 800/782-8310; 740/289-1251
fax: 740/289-1253
e-mail: ocinc@zoomnet.net
website: www.oakchipsinc.com
PLEASE SEE OC INC AD, PAGE 83.

Premier Wine Cask

Premier Wine Cask is the exclusive North American representative for **Tonnellerie Dargaud & Jaeglé (D&J), Marcel Cadet,** and **Tonnellerie Vallaurine**. For three generations, D&J has crafted fine barrels for the top wineries in the world. Exhaustive wood selection and an unwavering commitment to traditional craftsmanship make the D&J barrel predictably elegant. Dargaud & Jaeglé's unique water-bending process conducts heat from an oak fire deeply into the wood to create a subtle and sophisticated spiciness, unmatched by any other barrel.

DARGAUD & JAEGLE
Tonnellerie

Premier Wine Cask is also the exclusive worldwide representative for **Barrel Associates International American Oak Collection**. Whenever one or more of their traditional innovative bending and toasting regimes are involved (DeepToast™, Water Bent, Fire Bent), a wine gains luscious depth, complexity, and palate length.

BARREL ASSOCIATES

Premier Wine Cask was selected as sole representative for **Innovative Rack System LLC**, and **BiBung**. Innovative Rack System is a unique steel core polypropylene deep cradle rack designed for safe and secure barrel stacking and moving. The new BiBung is a one-of-a-kind barrel bung that provides a better barrier against oxidation and airborne haloanisole contaminants.

For more information, contact:
Premier Wine Cask, Inc.
tel: 800/227-5625
e-mail: info@premierwinecask.com
website: www.premierwinecask.com

PLEASE SEE PREMIER WINE CASK AD, PAGE 49.

ReCoop, inc.

True Barrel Refurbishing

ReCoop's mission is to double the useful life of customers' barrels, while ensuring their capability to produce excellent wine. ReCoop is committed to conservation without compromise to wine quality by maximizing the potential benefits afforded by a wine barrel.

ReCoop

After years of research and development, ReCoop's patented process renders neutral barrels into like-new ones. Working in partnership with customers, over 85,000 barrels have been "ReCooped" since 1989. Customers have benefited from a cost-effective solution of prolonging the oak transfer, color stabilization, and oxygenation benefits afforded by their barrels while at the same time scoring in the 90s and winning accolades.

As a service to customers and to provide an affordable solution for the home winemaker, ReCoop is now also manufacturing barrels in 10-, 15-, 20-, 30- and 45-gallon capacities from ReCooped French and American wood in a variety of toast levels.

With ReCoop, customers enjoy the increasing pleasure, respect, and visibility while supporting green manufacturing in the industry, without compromise to wine quality.

For more information, please contact:
ReCoop, Inc.
2010 Barlow Ln., Sebastopol, CA 95472
tel: 707/829-7103; fax: 707/824-0365
e-mail: info@recoop.net
website: www.recoop.net

Roberts & Son

Beautiful new French and American oak barrels from **ROBERTS & Son** are coopered in Sonoma County, CA. The oak quality, first-class production equipment, and classic toasting techniques are verifiable at Cloverdale, CA.

Keith Roberts has built and operated three of the seven major cooperages in California. His wine barrels represent over 35 years of experience with oak sourcing, extended air-drying, and optimal toasting regimes. Nathan Roberts began coopering barrels with his father in 1991.

French oak ingredients for **ROBERTS & Son** barrels are sourced from NT Bois, Charlois, and Canadell, three of the top "merrandiers" in France. All split French oak is rigidly inspected, stacked, and carefully seasoned for 24 months or longer in Champagne or Cognac. Conditions in the stave parks are optimal for ageing the raw material.

R
Roberts & Son

American white oak for **ROBERTS & Son** comes from Cardwell Lumber at Novelty, MO. Cardwell staves and headings are naturally dried for a minimum of 24 months. Head toasting for the **ROBERTS & Son** Missouri-origin barrels is uniform and consistent. Individual headboards are deeply toasted via ceramic elements utilizing gas heat.

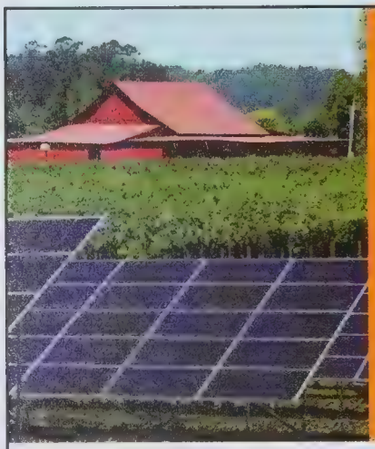
Standard Bordeaux and Burgundy barrel styles are available. Specialized versions produced include 70-gallon and thin stave export.

You will want to order new **ROBERTS & Son** barrels early in 2008 since production is definitely limited.

For more information, contact:
The Boswell Company
1000 Fourth St., #640, San Rafael, CA 94901
tel: 415/457-3955; fax 415/457-0304
website: www.boswellcompany.com

PLEASE SEE ROBERTS & SON AD, PAGE 18.

Visit PW
grapegrowing/winemaking
www.practicalwinery.com



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T.W. Boswell

The latest edition to the T.W. Boswell collection is the Eau barrel. Made for winemakers who like the water-immersed method, this barrel frames and adds a supple and elegant texture to select fruit. A percentage of the proceeds of the T.W. Boswell Eau barrel are donated to celebrate, protect, and restore San Francisco Bay through the Save The Bay organization.

T.W. Boswell EAU

Experienced master coopers developed the T.W. Boswell collection that also includes the Côte d'Or, Côtes du Rhône, Médoc, and Legacy barrels. Each has a distinct personality built for reserve style wines.

The Côte d'Or provides traditional Burgundian toastiness, while encouraging fruit expression. The Côtes du Rhône is best-suited for Rhône varietals and blends. The Médoc barrel is made for more concentrated wines that suggest aging. The Legacy is a subtle old-world style barrel that adds texture and maintains a proper balance of fruit and oak.

The Appellation Series is crafted of premium French oak produced at the PEFC-certified stave mill. Legacy and Eau barrels are available in American, French, hybrid, or Eastern European oak.

For more information, contact:
T.W. Boswell
Jason Stout, Yuri DeLeon, Jerry DeLorenzo, Gary Kroll
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e-mail: info@twboswell.com
website: www.twboswell.com

PLEASE SEE TW BOSWELL AD, PAGE 9.

Nadalie USA/Tonnellerie Francaise

Marion Blanchet has joined the cooperage to fill the position of Aurelia Rivier in the Oak Add Ins department alongside Raynah Obaza. The Oak Add Ins department provides powder, mixture, chips, cubes, dominoes, blocks, oak barrel chains, barrel inserts, tank staves, and WineWood that are toasted over a traditional open wood fire in the same manner as barrels are toasted.

Frederic Pavon joined the Calistoga, CA team in 2006 as shop foreman and master cooper from France. Pavon comes with a wealth of coopering knowledge and is revitalizing the expertise and art of coopering in Calistoga.

Nadalie, USA provides the finest of barrels manufactured from American oak, French oak, and Hungarian oak in whatever style, toast, and capacity fits your specific wine needs. Come visit the only full-line cooperage in the country.

Nadalie, USA/Tonnellerie Francaise
1401 Tubbs Ln., Calistoga, CA 94515
tel: 707/942-9301, fax: 707/942-5037
e-mail: info@nadalie.com
website: www.nadalie-usa.com

PLEASE SEE NADALIE USA AD, PAGE 39.

NADALIE
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- Providing expert workers
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- Disease detection, monitoring of insects, and weed control
- Providing soil, water and tissue samplings
- Pressure bomb analysis to determine water levels and irrigation timing
- Vineyard Field Worker Safety Certification to your workers

OUR INVITATION TO YOU

As partners in Buena Tierra Vineyard Management Corporation Inc. we invite you to call us directly at 707-944-2611 to learn more about organic farming.

Buena Tierra Vineyards Inc.
Management & Consulting

P.O. Box 3928 Yountville, CA 94599
Phone 707-944-2611 Fax 707-944-2611
info@buenatierravineyards.com

Skolnik Industries, Inc.

Skolnik stainless steel cooperage is designed to meet the special needs of winemakers in all stages of fermentation, maturation, and storage of fine wines. Skolnik has a long and proud tradition of providing leading winemakers with stainless steel drums of high quality, durability, and design.

Skolnik's wine industry customers look to stainless steel cooperage to supplement oak barrels in key stages of the winemaking process. Stainless steel offers unique and unsurpassed qualities for preserving product integrity and purity — important considerations for why stainless is a key tool for winemakers.

SKOLNIK INDUSTRIES, INC.
MANUFACTURERS OF STAINLESS STEEL BARRELS

Stainless steel cooperage is:
- Versatile and adaptable to many uses,
- Ready for use after being sterilized,
- Cost-effective and long-lasting,
- Predictable, reusable, and easy-to-clean,
- Virtually maintenance-free,
- Available in sizes from 5 to 55 gallons.

Skolnik is a full-service manufacturer of steel containers and accessories. Every Skolnik container is thicker, heavier, and stronger than industry standards — a commitment made to customers for more than 75 years.

For more information, contact:
Skolnik Industries, Inc.
Jason Snow
4900 S Kilbourn Ave., Chicago, IL 60632
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website: www.skolnik.com

PLEASE SEE SKOLNIK AD, PAGE 41.

Tonnellerie Allary

Tonnellerie Allary embodies the best of French know-how: Art and Tradition. Two generations and 60 years of experience combine to produce the highest quality French and American oak barrels from 28 to 500 liters, large cone vats from 10 to 200 HL, and top-grade French chips originating from the same oak as the stave wood, always ensuring 100% traceability.

TONNELLERIE ALLARY FRANCE

Allary Cooperage supplies to the great French wine houses, exports to five continents, and draws from its age-old experience to ensure quality and consistency today and for the future. A close relationship between wood and wine is the Allary passion. Working closely with winemakers, Allary listens carefully to their needs, offers toasting to exact specifications, and a choice of tight and medium grain oak from French forests (Allier, Vosges, Nièvre). Each and every stave used in Allary production is thoroughly inspected and must conform to rigorous standards for quality.

You are invited to experience the Tonnellerie Allary savoir faire and why Allary was awarded the Meilleur ouvrier de France, Médaille d'or 1986, 1994, 1997, 2003. L'ART ET LE RESPECT DE LA TRADITION.

For more information, contact:
Tonnellerie Allary
Nicholas Keeler
PO Box 339, Amity, OR 97101
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e-mail: nickk@amecousa.com
website: www.tonnellerie-allary.com

PLEASE SEE TONNELLERIE ALLARY AD, PAGE 58.

Tonnellerie Bel Air

Tonnellerie Bel Air's unique system of tasting oak, tree by tree, places Bel Air among the top-tier of innovative, artisanal coopers. Located near Bordeaux, Tonnellerie Bel Air produces a range of competitively-priced Bordeaux- and Burgundy-style barrels using 100% French oak.

Recognizing that every tree differs according to its immediate growing environment, Bel Air has developed a detailed protocol of blind tasting stavewood through a water infusion process in order to assess variation of the wood's character. This procedure is employed monthly throughout the wood-aging period to determine, on a sensory level, the optimum aging time.

Bel Air tonnellerie

Once properly seasoned, stavewood is again tasted to define an oak profile and to categorize the wood, primarily according to its tannin structure, flavor characteristics, and the volume and texture it may offer a wine.

Barrels are customized by focusing on each winemaker's desired results and by understanding how oak may influence a wine's style. Being a small-scale operation, it is the cooperage's goal to define oak blends and toast levels to suit a wine's structure and customer's aims. Barrel consistency, from year to year, runs high through Tonnellerie Bel Air's dedication to the principles of its oak tasting method in tandem with the quality service offered to its customers.

For more information, please contact:
Tonnellerie Bel Air
Arminée Chahbazian, U.S. representative
364 College Ave., Angwin, CA 94508
tel: 707/965-2119; fax: 707/965-2923
e-mail: ac@arminee.com

VinOak

For more than 10 years, VinOak has provided the highest quality oak barrels and alternatives to winemakers around the world. Strong wood sourcing partnerships in France and the U.S. consistently provide VinOak with the finest materials for barrels and alternatives.

In 2007, VinOak introduced two new barrels. ***Quercus Cooperage*** French oak barrels utilize a patented TRH convection-toasting process yielding great consistency and a unique toasting profile. The ***VinOak Selection*** American oak barrel is a result of a 10-year partnership with Kelvin Cooperage in Australia. The barrel specification was developed by VinOak and is made at the Kelvin Cooperage (Louisville, KY).

VinOak USA

In October 2007, VinOak USA became the sole distributor of ***Kelvin Cooperage*** American oak barrels in California, Oregon, and Washington. In 2008, VinOak USA will also introduce ***VinOak Selection*** ultra-premium French oak barrels.

VinOak offers a complete line of barrel alternatives in both French and American oak. Proper sourcing, seasoning, and consistent toasting are what VinOak believes to be the keys to success.

VinOak maintains a consistent research/development program using in-house GC/MS analysis to quickly provide analytical results to complement sensory evaluation. VinOak is staying at the forefront of TCA/TBA quality control by implementing a three-stage testing program for both barrels and alternatives to minimize any possible contamination.

For more information, contact:
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Ian Hartnett
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tel: 707/746-5704; fax: 707/746-7471
e-mail: ihartnett@vinoakusa.com
website: www.vinoakusa.com

PLEASE SEE VIN OAK AD, PAGE 31.

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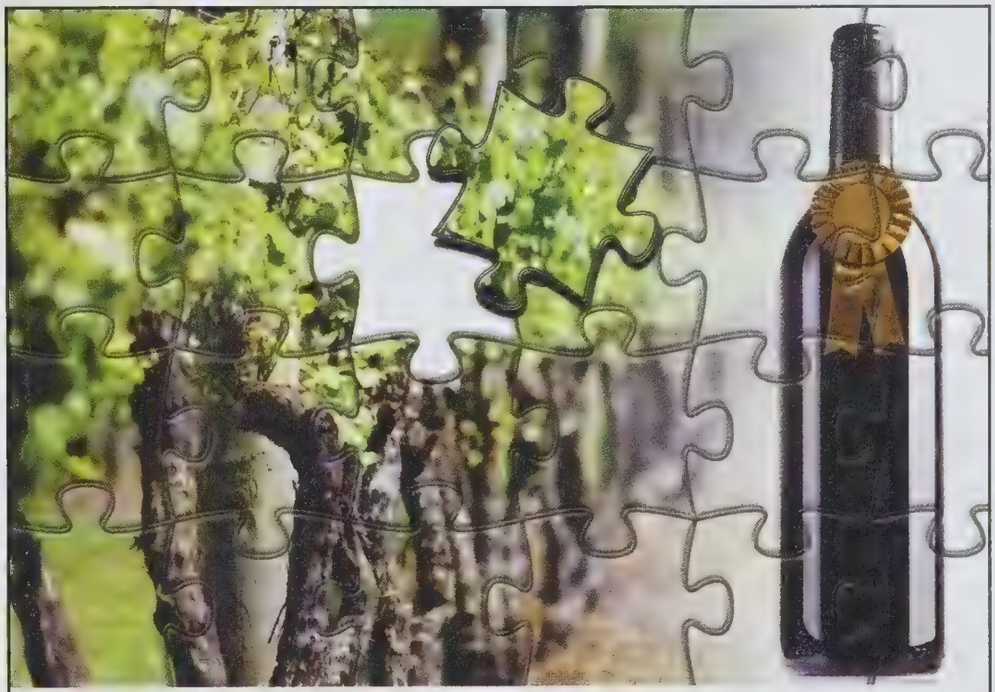

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FOR MORE INFORMATION
888.897.3030
info@winegrowingconsortium.com
www.winegrowingconsortium.com

Tonnellerie Boutes

Boutes has been a family tradition for over 120 years. Family-owned and operated by Henri Barthe and his two sons, Eric and Pierre, Tonnellerie Boutes is located in the heart of the Bordeaux region of France.

Through the Office Nationale des Forêts, Boutes self-sources 75% of its stave-grade standing trees from the best forests in France. For over 10 years, this has made Boutes the leading purchaser of standing trees in the Department of Allier. Purchasing by this method would not be possible without the skill, experience, and knowledge of Boute's foresters who annually assess wood available for purchase.

Unique to Boutes is the *stave immersion* process that prepares and controls the refining of oak tannins. This, along with exclusive use of the finest oak woods and the knowledge of its master coopers, allows Boutes to offer a unique blend of *innovation*, *tradition*, and *art* in crafting barrels that achieve perfect harmony between wine and the barrel.

Boutes barrels are available in various French forest-types, and Eastern European oak. All barrels can be coopered to specific toast levels, with two- or three-year-old wood, or as *Grande Reserve*. Barrel sizes available are: 225L, 228L, 265L, 300L, and 500L.

For more information, contact:
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e-mail: boutesusa@sbcglobal.com
website: www.boutes.com

PLEASE SEE TONNELLERIE BOUTES AD, PAGE 86.

Tonnellerie de Jarnac, USA

A craftsman's cooperage dedicated to good taste, traceability, and service. For 27 years, Tonnellerie de Jarnac has crafted French oak barrels with a quest for excellence and consistency.

Tonnellerie de Jarnac owns and operates a stavemill near Bordeaux. Every year, the best oak is sourced and selected from all French forests to offer winemakers a combination of different oak characteristics and "terroir" to complement their wines.

Tonnellerie de Jarnac barrels are fire-toasted in a traditional way to achieve unique style, personality, and complexity of flavors and aromas.

Using the master cooper's 25 years of experience with Tonnellerie de Jarnac and customer feedback, Tonnellerie de Jarnac works closely with winemakers to meet their expectations for a high-quality and consistent barrel.

Yannick Rousseau, technical director and managing partner, brings his winemaking background and eight years of experience with Newton Vineyards and Chateau Potelle in Napa Valley to collaborate and taste wines with winemakers, and determine which oak selection and toast level work best with each wine.

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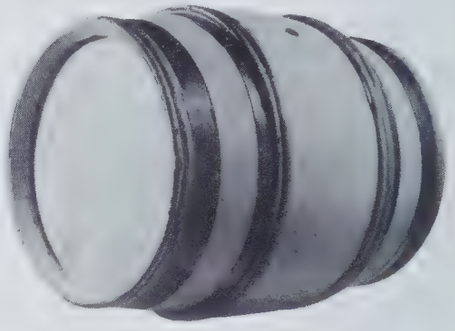
e-mail: yannickrousseau@sbcglobal.net
website: www.tonnellerie-de-jarnac-16.com

PLEASE SEE TONNELLERIE DE JARNAC AD, PAGE 33.

Tonnellerie Sirugue

Tonnellerie Sirugue is a family cooperage established in 1903 in Nuits Saint Georges, Burgundy. Sirugue barrels were among the first French oak barrels to be imported to the U.S. for fine wine ageing in the 1950s and 1960s.

Today, Sirugue focuses on wood selection, which is the basis of the cooperage's tasty barrels. Sirugue's wood is selected exclusively from French oak forests in the Allier, Nevers, Chatillon, and Vosges regions. The staves are naturally air-dried in Burgundy for a 24-month minimum. A 36-month, air-dried program is available also.



Sirugue produces Burgundy Traditional, Burgundy Export (228L), Bordeaux Export barrels (225L), Hogshead (300L), and Feuillettes (114L).

Aside from its traditional house-toast, Sirugue has worked intensively to achieve different toasting levels tailored to each customer's individual needs and style demands.

Sirugue's goal is a seamless integration of fruit and oak. The barrels can be sweet, spicy, subtle, and elegant; they enhance a wine's fruit characters and flavors; they lift the fruit, frame it, and make a star out of it.

For more information, contact:
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e-mail: sirugueusa@earthlink.net

United Barrels

United Barrels provides a wide variety of products, from a range of suppliers, for oak aging of wines and spirits. For top-of-the-line reserve wines, Tonnellerie Loureiro provides a rich, smooth mouthfeel with no bitterness, astringency or acidity due to its meticulous even, deep-toasting process.

Tonnellerie Chalufour, long-prized for the roast chestnut aromas it brings to barrel-fermented Chardonnay and Rhône varietals, also offers an inexpensive "workhorse barrel," French oak but not forest-designated, with a loose grain selection.

United Barrels no longer offers the Balkan Oak brand. Several potential suppliers of Eastern European oak that could meet quality standards are being explored.

Moxon Oak now offers alternatives in three proprietary toasts, in addition to a traditional "House Toast": Hi-Vanilla, Complex, and Mocha, available in all product types from dust to tankstaves. In addition, there is a partnership with Burdigalia, Inc., producer of enological tannins in powdered form.

For more information, contact:
United Barrels
PO Box 178, Napa, CA 94559
tel: 707/258-0795
e-mail: scott@unitedbarrel.com
PLEASE SEE UNITED BARRELS AD, PAGE 26.

XTRAOAK

XTRAOAK is the oak-alternative division of Canton Wood Products (producer of Canton American oak barrels). For more than 30 years, XTRAOAK has provided the wine industry with the highest quality American and French barrel alternatives.

XTRAOAK products include French and American oak chips, granular oak (for use in fermentation), oak inserts for barrels and tanks (installation services are available for barrel systems), and two XTRAOAK exclusives: XOAKERS (1-inch solid oak spheres for use in barrels and small containers), and the innovative OAK-ON-A ROPE oak chain for oak renewal of neutral barrels.

XTRAOAK oak is naturally seasoned and carefully toasted employing time-tested techniques of the cooper's craft. In addition, all XTRAOAK products are now HACCP-certified for food safety by the internationally recognized Bureau Veritas certification agency.

XTRAOAK products offer winemakers convenient oak options that can add interest and character to wines at a reasonable cost. XTRAOAK oak experts are available to answer your barrel-alternative questions and provide the best technical support.

For more information contact:
XTRAOAK
5803 Skylane Blvd. Ste. C
Windsor, CA 95492
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website: www.xtraoak.xom

World Cooperage

In its constant focus on quality, World Cooperage's parent company, cooperages, and mills were awarded ISO 9001:2000 certification. ISO certification requires a standardized quality management system that includes formal training programs, detailed work specifications, and controlled tracking procedures. This third party accreditation assures customers that they can expect the most consistent and repeatedly high-quality barrels. This certification complements the pioneering Barrel Profiling technology. Having total control and traceability over the toasting method allows World Cooperage to be absolutely reliable and consistent with this process.

ISO 9001 REGISTERED FIRM
URS CERTIFICATE NO. 25139

Based on scientific research of formation of extractives such as vanillin, ellagic acid, and methyl guaiacol during the toasting cycle, World Cooperage defined more than 50 toasting profiles with different sensory attributes. The cooper inputs the barrel's wood specifications and desired toasting profile and the computer directs the cooper to increase, decrease, or maintain the barrel's toasting temperature to follow a desired profile.

World Cooperage works in partnership with customers to define a tailor-made profile, or winemakers can review the company's existing portfolio of barrel profiles. Once a winemaker has chosen a desired profile, World Cooperage uses the toasting technology for perfect replication. The system allows for repeatable barrel flavor profiles, barrel-to-barrel, and vintage-to-vintage.

For more information, contact:
World Cooperage
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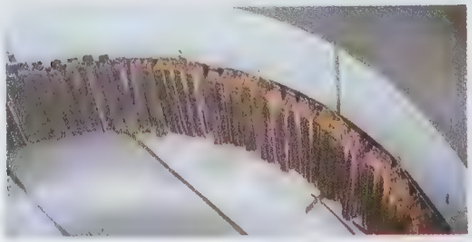
tel: 707/255-5900; fax: 707/255-5952
toll-free: 888/33-COOPER
e-mail: info@worldcooperage.com
website: www.worldcooperage.com

StaVin

All StaVin oak is naturally seasoned for a minimum of three years and fire-toasted by traditional methods to deliver the nostalgic aromas and complex flavors commonly associated with barrels. StaVin supplies French, American, and Hungarian oak in medium, medium-plus, and heavy toast levels.

The Savour oak line utilizes the same seasoning protocol with long-cycle convection toasting. After extensive research, a proprietary method has been developed to produce a convection-toasted oak that delivers sweet aromatics and a viscous mouth-feel to your wine.



StaVin's website (www.stavin.com/research.htm) explains the practical application of toasted oak and oxygen throughout the winemaking process to produce world-class wines. It is the definitive resource outlining innovations in oak and oxygenation for winemaking.

Reduce your dependency on barrels for flavor and aging. StaVin's Tank Stave Fan Packs deliver the same traditional flavors as barrels at a fraction of the cost. StaVin Oak Beans and Stave Segments are packaged in food-grade nylon bags making them versatile, cost-effective, toasted oak infusion systems for tanks. The Barrel Replica, Traditional Barrel Insert, and Infusion Tube will revitalize neutral barrels, imparting the complexity and quality of a brand new barrel.

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e-mail: info@stavin.com
website: www.stavin.com

PLEASE SEE STAVIN INCORPORATED AD, PAGE 42.

Tonnellerie Leroi

The "King of Coopers," Tonnellerie Leroi, introduces exceptional barrels to North America for 2007 wines and your 2008 barrel program, almost 300 years after the first Leroi coopers were hired!

Dating back to the early 1700s, Tonnellerie Leroi was founded as the exclusive cooperage for France's oldest Cognac house. Using the very best fine grain oak from the forests of central France, Tonnellerie Leroi today makes a full range of barrels for quality wine.

The particular climate in the heart of Cognac assists in seasoning the oak, creating integrated, finely textured flavors suitable for making balanced, consistent wines. Twelve master coopers are highly skilled to provide the finest, harmonious tannins, and oak aromatics.

Typically found in the Leroi medium toast barrel is a rich, toasted aroma with a touch of vanilla and a light smoky finish in the flavors, that is recommended for Cabernet Sauvignon, Merlot, and big Syrahs.

The Leroi Medium Plus barrel is noted for a toasty and light, smoky nose, with a touch of caramel and spice flavors. More Burgundian in profile, it is recommended for Chardonnay, Pinot Noir, and lighter reds.

Each barrel has a unique barcode to provide the wood stave history, while also being 100% TCA-free. Barrels include: 225L Bordeaux export, 225L export thin stave (22mm), and 228L Burgundy. Hogsheads, puncheons, wood tanks are also available.

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e-mail: info@leroibarrels.com or m.mercer@tonnellerie-leroi.com
website: www.leroibarrels.com or www.tonnellerie-leroi.com

PLEASE SEE TONNELLERIE LEROI AD, PAGE 60.

Tonnellerie Quintessence

Tonnellerie Quintessence intertwines cherished, centuries-old French tradition with modern technology and defines the cooperage art. Master French coopers craft barrels with experience and the reassurance of statistical controls. Tonnellerie Quintessence crafts barrels from the finest oak, chêne français, milled in France's most sophisticated PEFC-certified stave operation. Expert wood buyers take great care in wood selection, searching the great forests for straight, tight grain oak.

Tonnellerie Quintessence uses a monitoring system to assure uniformity and to guide the master cooper through the toasting process. Working closely with the winemaker, Tonnellerie Quintessence is able to create barrels that complement and enhance the unique characteristics of the vintage. Tonnellerie Quintessence crafts a rare barrel that blends contemporary expertise with the style expected of a French cooperage.

Tonnellerie Quintessence is the U.S. distributor for Heinrich Cooperage based in the Barossa Valley, Australia. The 225L barriques and 300L barrels are ideal for winemakers wanting to make Australian-style Shiraz.

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website: www.tonnelleriequintessence.com

PLEASE SEE TONNELLERIE QUINTESSENCE AD, PAGE 7.

Tonnellerie Saury

Saury has been producing fine wine barrels since 1873. Saury U.S.A. offers "La Bourgogne" Burgundy barrels; a strong American oak commitment; the Saury Red Fermentor Division; and an extensive TCA screening and control system.

Saury's "La Bourgogne"* is focused on Pinot Noir, Chardonnay, and Syrah. The results? Creamy textures, deeper aromatics, and silky tannin integration. "La Bourgogne" doesn't break the bank, either.

The American oak program includes two grain selections. Saury American oak provides structure and style with finesse without brutal power or excessive extract, and has a proven track record with Zinfandel, Syrah, Sangiovese, Tempranillo, and Cabernet Sauvignon.

Saury French Oak Upright Conical Fermentors (10hl to 150hl)* are ready for 2008 installation.

The first growths can't be wrong. Saury Chateau barrels reside in the chaix of the top Crus in Bordeaux. See the true expression of your Cabernet and Merlot in a Saury Chateau Ferre barrel.

Saury puncheons are available.

With one of the largest stave yards in the industry, Saury provides the most consistent barrels available.

Saury employs a multipoint TCA testing program* unmatched among cooperages. Saury is proactive and leads the fight against TCA and its related compounds. Saury is the only cooperage to be fully complaint with ISO 9006 and HACCP standards, with full traceability of the wood.

*Have a visit with Bayard or Michael for more information.

For more information, contact:
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PO Box 672, Rutherford, CA 94573
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e-mail: info@sauryusa.com

PLEASE SEE TONNELLERIE SAURY AD, PAGE 46.

Pickering Winery Supply

Pickering Winery Supply offers barrels from Burgundy and Bordeaux.

Tonnellerie Vernon's success comes from providing consistent barrels every year. Customers can specify "Burgundy Blend" barrels with longer toasts, "waterbent" for Sauvignon Blanc, or a hybrid with American staves and French heads. Vernou produces small barrels from 20 liters, and upright tanks and ovals to 1,300 gallons. In 2008, Vernou has introduced a larger 1,200-liter roll fermentor.

Tonnellerie Meyrieux toasts barrels over small braziers for 1.5 hours to achieve a distinctive, smoky, fruit-driven barrel ideal for Burgundian varietals and Syrah. They offer 2-year and 3-year wood, and puncheons. Production is very limited from this tiny but highly regarded Burgundian cooper.

Tonnellerie Doreau's initial success has been with long-aging Bordeaux red wines. However, the barrels' elegance and slow extractability have proven ideal for Chardonnay, Italian reds, or any wines that require an oak back-bone for high-quality fruit. An unusual, untoasted barrel is the Selection Thierry Chauffe Blonde, a component barrel made with the finest-grain 3-year oak, intended for structured wines where the wood tannins will help the fruit to develop and stand forward.

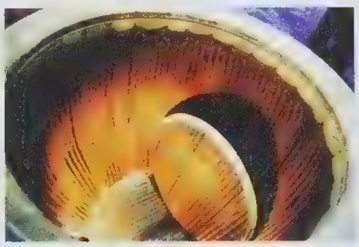
For more information, contact:
Pickering Winery Supply
888 Post St., San Francisco, CA 94109
tel: 415/474-1588; fax: 415/474-1617
e-mail: pickering@sbcglobal.net
website: www.winerystuff.com

Seguin Moreau Napa Cooperage, Inc.

Seguin Moreau, the first eco-certified cooperage and first to attain Chain of Custody certification in 2005, offers French oak barrels certified to originate from environmentally, sustainably-managed French forests.

Seguin Moreau produces French oak barrels coopered in France and Napa. Barrels are constructed from logs purchased through the French National Forestry Office, aged in France, and toasted to meet customer specifications. Seguin Moreau European Reference barrels and Russian oak barrels are produced at the Napa Cooperage.

Tight grain American oak is selected from throughout the mid-west to blend for consistency and complex flavor profiles. The trademarked "U-Stave" barrel offers a winemaker a unique flavor profile for Zinfandel, Syrah, Cabernet Sauvignon, or Merlot.



An increasing popular barrel is the hybrid barrel with American oak staves and French oak heads.

Seguin Moreau France offers large upright tanks, oval foudres, and round casks. Each vessel is customized to customer specifications.

"ICONE CONCEPT" is the newest research that focuses on analysis of the "Oenological Potential" of French oak wood that is chemically analyzed from the start of the aging process until the end to optimize tannin refinement, achieve optimum aromatic quality, and monitor phenolic compounds within specific lots of wood. **ICONE** barrels are available in a limited quantity.

For more information, contact:
Seguin Moreau Napa Cooperage, Inc.
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e-mail: info@seguinmoreau.com
website: www.seguinmoreaunapa.com

PLEASE SEE SEGUIN MOREAU AD, PAGE 91.

Kelvin Cooperage

Kelvin Cooperage has been family-owned and operated since being founded in 1963. Attention is given to every aspect of coopering providing clients the best barrel possible. The toasting process guarantees a deep, penetrating, and consistent toast from year to year, including the new Hydra-Toast™ regimen which significantly softens tannins.

American oak is sourced from the best mills in the best oak regions. French oak is coopered in Louisville from tight grain Centre of France oak. All Kelvin oak is exposed to Kentucky's climate, and is naturally air-dried for at least 24 months.

VinOak USA now represents Kelvin Cooperage on the West Coast. The relationship with VinOak allows Kelvin to offer unsurpassed levels of service and cutting-edge sensory and quality control analysis.

For more information, contact:
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West Coast Sales
VinOak USA
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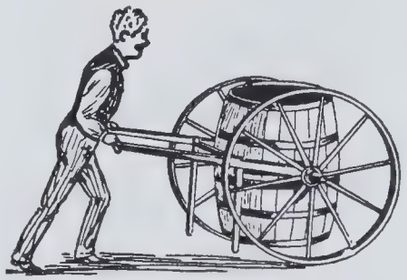
e-mail: ihartnett@vinoakusa.com
website: www.vinoakusa.com

Bouchard Cooperages

Bouchard Cooperages is a barrel brokerage representing:

Les Tonnelleries de Bourgogne (**Damy** — Meursault, and **Billon** — Beaune) has provided barrels and puncheons to American producers of Chardonnay, Pinot Noir, and other fine wines for more than 20 years. Both cooperages specialize in French and Eastern European oak barrels and puncheons.

Vicard Tonnelleries (Cognac) is a 100% family-owned and operated company, ISO 9002-certified for barrel fabrication. The latest technology is incorporated with age-old tradition to control the heating process and produce barrels, puncheons, and tanks made from high-quality French, Eastern European, and American oak.



Tonnellerie Cadus (Ladoix-Serigny) is a partnership formed by Maison Louis Jadot of Burgundy, Vicard Tonnelleries, and Vincent Bouchard to produce ultra-premium barrels. All Cadus staves are air-dried in Burgundy for at least 30 months.

Arobois (Gagnac Sur Cere) is a premium manufacturer of French oak powders, chips, and blocks made from cooperage-grade oak staves that are air-dried and toasted on-site.

In partnership with the above coopers, Bouchard Cooperages invites customers to access the company's website, www.bouchardcooperages.com, which contains results of an analytical survey of barrels, a current price list, and other interesting information about the cooperage industry and these suppliers.

For more information, contact:
Bouchard Cooperages
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e-mail: office@bouchardcooperages.com
website: www.bouchardcooperages.com

SUPPLIER GRAPEVINE

Certification awarded to ETS satellite labs

ETS Laboratories (St. Helena, CA), announces that its three satellite laboratories have been accredited ISO/ IEC 17025 through the American Association for Laboratory Accreditation (A2LA). This accreditation provides objective evidence of the facilities' technical competence and distinguishes them from non-accredited laboratories offering similar services.

In addition, ETS Laboratories complies with stringent A2LA Food Testing Program requirements, containing the "AOAC International Guidelines for Laboratories Performing Microbiological and Chemical Analyses in Food and Pharmaceuticals."

The main ETS facility (in Napa Valley, CA), was the nation's first independent wine laboratory to achieve A2LA accreditation. With the addition of accredited satellite facilities in McMinnville OR, Walla Walla WA, and Greenfield (Monterey County), CA, ETS now extends its accredited analytical methods throughout the western U.S. wine region.

"We added these laboratories to increase convenience and response time for our customers in Oregon, Washington, and Central California," says Gordon Burns, ETS Technical Director and President. "Having earned AOAC enhanced A2LA accreditation, these facilities now join our St. Helena Laboratory in meeting the most stringent qualifications in the industry."

ETS continues to meet and exceed the wine industry's analytical needs by providing the highest standards of analytical data, quality assurance, customer service, and client confidentiality.

For more information, visit www.ets labs. com.

Continued from page 63

produced during sur lie ageing, Linda Bisson (UC Davis); Vegetative aromas, Sue Ebeler (UC Davis).

Jan. 29 2:45 PM **Sustainable management of winery water, wastewater and energy resources** — Chris Savage (E&J Gallo Winery, CA); Doug Young (Winemakers Federation of Australia); Bob Chrobak (Kennedy/Jenks, CA); Bill Cooper (Cooper-Garrod Vineyards, CA).

Jan. 30 2 PM **Reduction Redux: The Good, Bad, and Nutty** — A candid peek under the lees, Greg LaFollette (DeLoach Vineyards, CA); The Champagne maker's advice, Mark Brevot (Moët et Chandon); The closure issue, Peter Godden (AWRI, Australia).

3 PM **SO_2 Analysis** — Automated SO_2 analysis for any size winery, benefits and challenges of working with different methods. Steve Tallman (E&J Gallo Winery, CA), Fred Miller (Woodbridge Winery, CA).

Jan. 31 2 PM **Tempranillo:** climatic conditions for grapegrowing, and winemaking styles. Jesús Yuste (Instituto Technologico Agrario de Calstilla y Leon, Spain), Peter Sisseck (Domino de Pingus, Spain), Markus Bokisch (Bokisch Ranches, CA), Scott Klann (Twisted Oak Vineyards, CA), B. Kiley Evans (Abacela Winery, OR).

Business / Finance / Operations Sessions

Jan. 29 2 PM **How to have a mostly worry-free interaction with TTB** — Regulatory requirements and issues of interest to wineries, bonded wine cellars, and wine industry professionals. Perky Ramroth and Dave Royalty (Tax & Trade Bureau, CA), Doreen Marin (TTB, Washington, DC).

3 PM **Does U.S. have the capacity to compete in 2010?** Analytical look at whether grape acreage, processing capacity, and industry infrastructure can keep up with increased wine market growth. George Schofield (Schofield & Associates, CA), Jeff O'Neill (O'Neill Vintners & Distillers, CA), Steve Dorfman (Joseph W. Ciatti Co.).

Jan. 30 2 PM **Where to find capital for growth of vineyards and wineries, and necessary price-points to justify growth.**

Jan. 31 2 PM **Strategic alternatives for grape growers in the future of wine industry, and how to function in it.**

Marketing / Public Relations Sessions

Jan. 29 2 PM **Taste the competition** (tasting included). International competitors discuss products, and brand positioning that has contributed to success. Chris Grenaille (Director of European Estates, Diageo, France), Paolo/ Allison Domeneghetti (Domaine Select, Italy), Jennifer Jo Wiseman (E&J Gallo Winery, CA).

Jan. 30 2 PM **Lifestyle media: tapping into non-traditional wine PR channels**. Sarah Snyder (*Sunset Magazine*), Trent Preszler (Bedell Cellars, NY), Linda Parker (Wagstaff Worldwide, CA).

Jan. 30 3 PM **M-powered: Harnessing your marketing power at wine tastings, trade shows, and competitions**. Gary Eberle (Eberle Vineyards, CA), Jim Trezise (New York Wine & Grape Foundation), Sara Gorr (Cliff Lede Vineyards, CA).

Jan. 31 2 PM **Direct-to-Consumer** — Four channels of DTC marketing; which efforts are considered state-of-the-art, and how to implement into marketing plans. Craig Root (Craig Root & Associates, CA), Michael Brill (CrushPad, CA), Brian Baker (Jackson Family Estates, CA), Britney Blete (Tolosa Vineyard & Winery, CA).

Schedule is subject to change. Visit www.unifiedsymposium.org for program updates.

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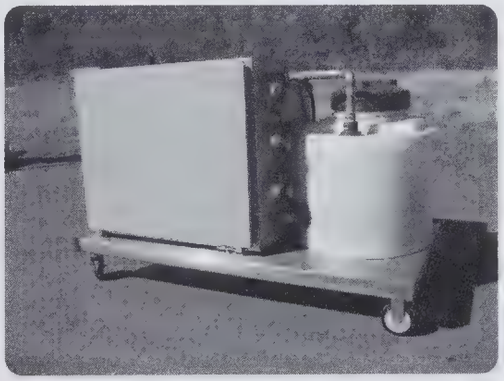
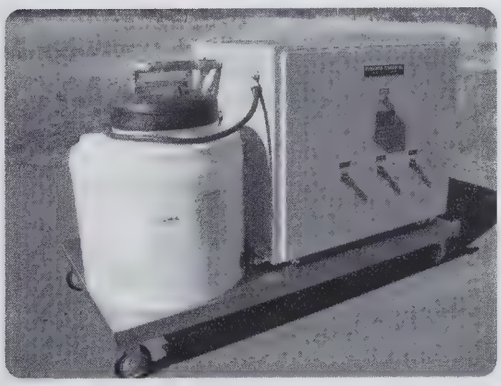
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SMART VITICULTURE *by Dr. Richard Smart*

Are you keeping up with the ASEV Journal?

Undoubtedly, the great majority of the readers of this column are practicing grape and wine producers. What proportion of you are members of the American Society for Enology & Viticulture (ASEV) and receive the *American Journal of Enology & Viticulture*, published four times each year?

I ask because I am curious about how inclined practitioners in the wine sector are to use articles written by scientists. Do you like to read these articles at the source, or would you rather obtain them via a third party, such as a consultant or a trade journal like *Practical Winery & Vineyard*?

Do you understand the very important role the American Society of Enology & Viticulture has in the world's English-speaking wine sector?

My most recent copy of the *Journal* is volume 58, number 2, 2007, suggesting that the *Journal* was first published 58 years ago, in 1959. At that time, the University of California at Davis was the pre-eminent English-speaking school of grape and wine education in the world. I can recall colleagues from UC Davis telling me how the idea to found the American Society of Enology & Viticulture came about and how it was accepted by the small wine industry at the time.

Now almost 60 years have passed. For many around the world, UC Davis is still regarded as pre-eminent, as is American wine and vine technology. Certainly other English-speaking countries, such as Australia, South Africa, and New Zealand, have much to appreciate for the foresight of their American colleagues. All of these countries have now formed their own societies of enology and viticulture based on the American model (although the spelling of oenology has differed!).

Is the *Journal* of ASEV "dry and dusty" and only suited to scientific dialogue? Or are there articles of interest to practicing viticulturists and enologists? I believe the most recent *Journal* contains many articles of practical interest. The remainder of this column discusses some of them.

GPS and terroir

Dr. Andy Reynolds and his colleagues at Brock University in Ontario, Canada, did a comprehensive study with Reisling from 1998 to 2002. They used GPS to define spatial variation in soil texture and various vineyard attributes, including tissue composition, yield components, berry and must composition, and weight of cane prunings.

Fruit from vines of different vigor classes within each soil texture group was made into wine and subjected to chemical and sensory analysis. Interestingly, soil texture and vine vigor had no consistent effects on the fruit or wine composition. The scientists analyzed many aspects of the vines and wines, but they concluded that vintage and wine age had more impact on wine sensory attributes than vine vigor or soil texture.

This paper is rich with data and an excellent study. The authors conclude that vine vigor does have a measurable effect on fruit and wine composition; however, neither the vine vigor nor the soil texture effects are consistent from one year to another. This is a substantial challenge to the notion of terroir, which is assumed to be always present, and essentially unchanging. The authors concluded that because the delineation of high and low vigor zones varies from year to year, the concept of zonal management is difficult.

What does a pressure chamber really measure?

Dr. Larry Williams of UC Davis recently published a paper about the effect of ambient temperature and vapor pressure deficit (VPD) on leaf and stem water potential. I have previously written in this column about the disadvantage, as I see it, of using the pressure chamber to determine irrigation scheduling. This was based on my personal experience of how sensitive the leaf water potential measurements are to temperature and relative humidity, which can be more correctly described as vapor pressure deficit. Williams studied many vineyards from northern to southern California and over a range of growing season water use.

He and his colleague found that both leaf and stem water potential vary proportionately to ambient temperature and VPD at the time of measurement. In the study, about 75% of the variation in leaf water potential of well-irrigated grapevines across four grape varieties and five locations and at different times of day and year could be explained by ambient vapor pressure deficit.

As I used to tell my students at Cal Poly State University (San Luis Obispo, CA), the pressure chamber is a clumsy way to measure air temperature. I should have more accurately said it is a clumsy way to measure relative humidity, or vapor pressure deficit.

For all of you running around with the pressure chamber in your pickup, using it to help assess when to irrigate, I suggest it would be easier for you to measure relative humidity instead. In a future column, I will discuss alternative techniques to the pressure chamber in irrigation management.

Wine closures and consumers

Drs. Anna Marin and Catherine Durham of Oregon State University studied the impact of various wine closures on consumers' purchasing and wine expectation. I have long had an interest in this topic and recall travelling in Europe about 10 years ago, asking producers of premium quality wines why they would not replace corks in their wines. Invariably, they said it was because consumers would never accept cork alternatives, even though these producers realized that a percentage of their wines would suffer cork taint.

Now I hear such comments more in the U.S. than anywhere else. By contrast, the majority of producers in Australia and New Zealand have switched to screw-capped wines, and some companies have also switched for their premium wines. Their

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logic is: Why would a winery jeopardize the presentation of its premium wine with the possibility of cork taint?

This study determined what many American producers already well knew. Currently, North American wine consumers have negative perceptions about screw caps in relation to wine quality. The difference between American and Australian consumers is noteworthy. Is this because American consumers are less aware of the possibility of corked wine?

This is an interesting study and will obviously have an impact on users of synthetic and screw-cap closures in the American wine market.

Pierce's disease and pruning shears

Dr. Rayda Krell and colleagues from the University of California at Riverside have studied the transmission of Pierce's disease (PD) to grapevines. They could not find any effect of root grafting on PD transmission, but they did identify two new insect vectors — the smoke tree sharpshooter and the Apache cicada. Both of these insects were found to transmit PD. The scientists also found that pruning shears can transmit the bacterium. The authors caution that, within any one region, there are many vector insects and also, perhaps, unknown vector insects — all of these can make control of the disease problematical.

Spain and ancient American grapevine varieties

The first of the existing American grape cultivars were introduced in Peru and Mexico by Franciscan and Jesuit friars between 1520 and 1540. Vineyards were intimately associated with missions promoted by the Spanish monarchy to Christianize the New World.

Dr. Alejandra Milla and colleagues from Chile and Spain have studied the large number of now indigenous cultivars in North America and South America that were spread by the Spanish invaders. This intriguing study examined the relationship between the existing ancient varieties in the western hemisphere and those of the Iberian Peninsula, which were much affected by phylloxera in the 19th century.

In the 1500s, cuttings could not be transported successfully, so grapevines were introduced as seeds. I think most of us know that, if we plant a seed taken from a Chardonnay berry, it will not necessarily produce a Chardonnay grapevine. Chardonnay will be the mother, but the father will be unknown. It could be Chardonnay, or it could be some other grape variety growing nearby. In any event, the result will be a unique individual plant.

Using DNA typing, the study looked at the origin of native varieties growing in South America and North America in relation to their Spanish origin. It shows the origin of the main South American varieties and the Mission grape variety of California to be Listan Prieto, which is an ancient Spanish variety now restricted to the Canary Islands. The variety has been lost from Iberia due to phylloxera.

Another variety found in the Americas was identified as Muscat of Alexandria, an ancient Mediterranean variety. The remaining varieties studied were natural hybrids of Muscat of Alexandria, Listan Prieto, or both. So the puzzle of the origin of the Mission grapevine has finally been laid to rest.

Conclusion

These papers and others in the same volume help me keep up-to-date with developments in grape and wine science. How many of you have the same advantage? I urge you to become members of the society of enology and viticulture in your country — however you spell oenology — and to take advantage of ASEV's *Journal*.

Response from eight readers to grammar quiz—

There was good interest in the grammar quiz at the end of my September/October-2007 column. The first correct answer was from Larry Whitted (PCA from Lodi, CA), and a UC Berkeley graduate. Along with his long experience of 27 years in pest management, and consulting in Chile, Argentina, and Europe, Larry enjoys languages and speaks English, Spanish, Greek, Italian, and German.

Larry and a couple of others said the second sentence was correct, because the word "varietal" is an adjective, not a noun! Therefore, the most common usage of the word in the U.S. is incorrect, one cannot talk of a "varietal" in place of the more correct term "variety."

I received several other interesting contributions. Glenn McGourty (UC Extension, Ukiah, CA), reminds us that the word "cultivar" is preferable to "variety" for wine grapes, from a botanical viewpoint. Several readers noted that my second sentence, "Godello makes an exciting varietal wine," contained sloppy grammar. It would have been more correct to say: "Godello grapes can be made into an exciting varietal wine." ■

Dr. Richard Smart, "the flying vine-doctor," is an international viticultural consultant based in Launceston, Tasmania, in Australia. He can be contacted by e-mail: vinedoc@bigpond.net.au. Read about Dr. Smart's business, including his consulting schedule, educational wine tours, and seminars, at his home page http://www.smartvit.com.au. He visits America frequently and his consulting schedule is arranged by Vinquiry in Windsor, CA, tel: 707/ 838-6312 and http://www.vinquiry.com.

***PWV* invites reader queries/discussion on any topic. Send your input to *PWV* at editor@practicalwinery.com, or fax 415/492-9325.**

COMPLIANCE COUNSELING *by Rachel Dumas Rey*

When is a winery not a winery?

Because of the high cost of real estate and the cumbersome permitting requirements in many wine regions, would-be wineries are looking for cost-effective ways to make and sell their wines without actually building their own winery and tasting room.

One of the most frequently asked questions wine compliance professionals hear is: "What sort of license allows me to have a winery without a building?"

The answer is to take advantage of another winery's facility, and fortunately, there is more than one way to do that.

The first option is to become a winery within a winery or, in regulation speak, an "alternating proprietor." Federal and state rules allow small proprietors to share winery facilities while maintaining separate businesses and licenses.

The second option is to hold wholesale licenses and enter into a custom-crush agreement with an existing winery. This is a good option for California business operators, because California law provides some special privileges that allow such an entity to act as a "virtual winery." Major differences exist between these two options.

What is an alternating proprietor?

An alternating proprietor is one of two (or more) independent wineries that each hold separate state and federal permits. Each is responsible for its own record-keeping and for its own bonded assigned areas within the host facility. This arrangement offers flexibility for winemaking and minimizes some paperwork.

Acting as an independent winery requires the alternating proprietor to be accountable for his or her own regulatory responsibilities, insurance coverage, and per-gallon excise taxes. All winery licensees must keep meticulous production and inventory records, file regular reports, and apply for federal approval for all product labels. The alternating proprietor is subject to state and federal audit at any time.

What is a virtual winery?

A virtual winery is a licensed wholesaler who owns one or more brands and contracts with an existing licensed winery or custom-crush facility to produce them. Virtual wineries have fewer privileges and fewer responsibilities because they are engaged in a custom-crush arrangement. The producing winery controls the winemaking process and is therefore responsible for all of the regulatory requirements associated with winemaking.

Unlike alternating proprietors, wholesalers do not have the same regulatory obligations (reporting and taxes) because they don't produce the product. Wholesalers typically take possession of the product after it is bottled and labeled (and reported and taxed).

Contract differences

Another important distinction between virtual wineries and alternating proprietors is the kind of contractual arrangement they have with an actual bricks-and-mortar facility where the wine is produced. An alternating proprietor (AP) must have a lease for space and equipment. The leased space is the AP's permanent bonded area.

Equipment like tanks and bottling lines alternate between the host winery and the AP, depending on whose grapes are in the press or tank. AP wine is in an alternating area; that alternating area is part of that AP's leased space. When the wine is moved, the space it leaves can either be occupied by another alternating proprietor or it will revert to the host winery.

Virtual wineries can operate out of a home office, and as long as they agree to store their products in an existing licensed warehouse, they don't need any additional licensed locations. Their contract with a producing winery is usually based on a price per ton of grapes or a price per finished case of wine. The price typically includes processing and bottling charges and state and federal excise taxes.

Choosing a production facility

Alternating proprietors are required to make their wine themselves. They can, however, contract with their host winery for some winemaking services, but they must be in control of the process.

According to veteran winemaker, Tom Eddy (Tom Eddy Winery and Tom Eddy Consulting, Calistoga,CA), making the decision to become a virtual winery or an alternating proprietor is a complex one. The solution depends on the size and design of the proposed facility and on individual client needs.

"Custom-crush programs are never perfect, because there are often miscommunications, and the customer may not be completely satisfied," Eddy says. "It is difficult for the producing winery to manage multiple winemaking protocols. The best custom-crush programs are wineries that were solely developed to provide a service to customers."

In terms of pricing, Eddy notes that both alternating proprietors and virtual wineries tend to make standard deals with standard pricing, and then pay an additional fee for extras. "It's about best price for best quality of work," Eddy adds. "In many cases, the price could be great, but the winery may be too large to service small, high-profile accounts effectively."

Costs

The costs associated with these two options vary greatly based on the number of cases produced and the services being provided by the host facility. As a rule, a small alternating proprietor producing fewer than 10,000 cases can save 12% to 28% on the cost of production over the same size virtual winery by not paying for winemaking services.

According to one large winery operator who provides both host facilities for alternating proprietors and custom-crush services, larger wine corporations are taking advantage of the custom-crush option for their second and third tier brands." In many cases, they contract production until the brand is established and use the resulting revenue to invest in infrastructure later. In some cases, establishment of these brands never results in the construction of a new processing facility.

An important component of the overall product cost is excise tax. All wineries pay a per gallon tax to state and federal governments. Small producers who meet certain criteria get very significant reductions in federal excise taxes, which can save up to $2.14 per case.

Virtual wineries are often contracting with large production facilities that are not eligible for this tax credit, which ultimately increases the virtual winery's cost of doing business. Conversely, most alternating proprietors do qualify for the per gallon tax credit, creating another advantage for those who are willing to get their hands dirty by making the wine themselves.

Timing

The time required to obtain proper licensing for a virtual winery (licensed wholesaler) or an alternating proprietor (winery license) is not significant. Processing a winery permit at the federal level with the Department of Treasury, Alcohol and Tobacco Tax and Trade Bureau (TTB) may take 30 to 90 days longer than processing a wholesale permit application but only if a site inspection is required. TTB will typically process and approve both types of applications for small proprietors within 60 days. The California Department of Alcoholic Beverage Control will typically process both types of applications in 60 to 90 days.

Direct-to-consumer market

The biggest distinction between alternating proprietors and virtual wineries is their access to consumers. Because alternating proprietors have the same permits as stand-alone bricks-and-mortar wineries, they are allowed to have both an on-site and an off-site tasting room and they can sell wine to consumers in all but a very few U.S. markets. Conversely, the virtual winery is limited in its access to consumers.

California, unlike any other state, has been progressive in its treatment of wine wholesalers and allows them, under certain conditions, to also hold a retail license to sell wine to consumers. These California virtual wineries can sell their wine to wholesalers, retailers, and consumers, but conditions of the license prohibit direct contact with customers through a storefront or tasting room. Until recently, wine wholesalers with conditional retail privileges were not, under any circumstances, allowed to pour wine for the public.

In May 2006, three virtual wineries were cited by the Department of Alcoholic Beverage Control for pouring wine at a non-profit event. These citations led to much discussion in the industry about the treatment of virtual wineries and eventually to the introduction of and passage of AB 323, also known as the Evans Bill.

On August 1, 2007 AB 323 was signed into law with new rules allowing holders of wholesale and conditional

retail permits to donate wine and to pour their wine at licensed non-profit events. The non-profit organization sponsoring the event must have a one-day event permit to serve alcohol and the wholesaler may only pour its own wine brand. This has been a win for the non-profit groups who benefit by these donations and also for the virtual wineries who have no other means of connecting directly with the public, because they are not allowed to have tasting rooms.

Today, virtual winery operators in California are only legally allowed to sell wine to consumers in about 13 states, because virtual wineries are considered to be retailers. The Specialty Wine Retailers Association (SWRA) is working hard to open markets for virtual wineries and wine retailers in an effort to have a "borderless wine market." If the SWRA has been successful, more states will be allowing direct-to-consumer sales from virtual wineries in California. ■

Rachel Dumas Rey is president of Compli, a full service beverage compliance firm in Paso Robles, CA. Prior to establishing Compli in 1997, she worked for the U.S. Department of Commerce's Export Administration in Washington D.C.

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PERSONNEL POINT OF VIEW *by Jay Manriquez*

Reaping the benefits of bilingual training

Imagine a training workshop with 10 participants — cellar and vineyard crew leaders and supervisors from several local wineries. Focused on developing supervisory skills, workshop topics include effective communication, motivating employees, dealing with difficult people, managing gossip, and delivering feedback.

Animated discussions arise about the specific issues, challenges, and problems faced by these valuable winery employees. They share their experiences, learn how their peers have handled similar situations, and ask the training facilitator many questions based on their daily interactions with their crews.

At the lunch break, the participants gather in small groups to continue discussing various topics brought up in the workshop and share ideas from different perspectives. At the end of the workshop, they provide feedback about the training and their learning experience (they rated the workshop 4.44 out of 5 in overall value.)

The training workshop described above is typical in every way except one. It is conducted entirely in Spanish.

Winery leaders have learned that conducting specialized training sessions for their Spanish-speaking employees provides both short-term and long-term results and benefits. When winery leaders understand Latino culture and strive to help their Latino managers, supervisors, and workers understand the American business model, they build loyalty and good will among employees and ultimately increase productivity and boost their winery's financial rewards.

In the May/June 2006 issue of *Practical Winery & Vineyard*, Mimi Lemanski, a trainer-consultant with The Personnel Perspective, explains what winery leaders have come to understand:

> "If we don't understand how a different culture learns, how effective can we be? Understanding Latino culture, and how they fit into the American business model, builds loyalty among employees and good will in communities, which ultimately results in meeting production and financial goals."

Short-Term Benefits

Communication — Lemanski states, "The usual cornerstones of communication — tone, body language, and words — aren't necessarily interpreted the same way by the two cultures." When the American business model is in operation, and employees have a different culture or language, these employees will translate the work experience through their respective culture's model.

Spanish-speaking supervisors or crew leaders who receive training in their native language on the supervisory and performance management styles that are part of the American business model have a greater chance of being successful within this model. They are more likely to accurately communicate meaning and information to a Spanish-speaking workforce. Thus, Hispanic workers can develop a foundation in the American business model and learn to function productively within that model.

Productivity — Effective communication results in increased productivity. When supervisors or crew leaders accurately communicate business goals or production expectations from English-speaking management to a Spanish-speaking workforce, the possibility of misunderstanding is greatly reduced, along with the likelihood of delays, rework, or safety issues.

Trust — Proactive employers create a foundation of trust and respect when they invest in the development of their employees and provide training in their native tongue. Such efforts pave the way for longer-term, committed relationships between wineries and their employees.

Long-Term Benefits

Loyalty — When a firm foundation of trust has been established, the Spanish-speaking workforce develops a commitment and loyalty to the company. Efforts by management to develop their Spanish-speaking employees convey a message that says "We honor and respect your culture."

Lower turnover — Training delivered in Spanish (or the native language[s] of the workforce) as part of a growth and retention strategy builds effectiveness by creating a work environment that bridges cultural differences, supports open communication and dialogue, and fosters effective supervision. Employees working under such conditions want to stay.

Financial gain — Investment in training and development of your winery staff will yield an exponentially higher return in the long run than the initial investment. Investment in bilingual training increases the opportunity of an even greater financial gain for the organization. Workers will then see training as a fair and equal benefit, available to all employees. Trained employees are skilled workers, and skilled workers produce more, higher quality work. Thus, bilingual training contributes to a positive bottom line.

Recipe for successful bilingual training program

Successful bilingual training programs should address the cultural differences of the workforce and the specific culture, goals, and needs of the organization. The most important ingredients for an effective bilingual training program are skills development and management support and reinforcement.

Trainees need to be able to apply what they've learned back on the job without fear of punishment or ridicule if they don't get it right at first. Providing a safe environment for applying learning from training, and especially bilingual training, ensures the greatest prospect for a high return on your investment.

Former Chrysler CEO Lee Iacocca once said, "You can have brilliant ideas, but if you can't get them across, your ideas won't get you anywhere." The same can be said of the mission, goals, procedures, values, and performance management practices of your winery. When your workforce understands what you want to achieve and how they can contribute, you'll be on your way to getting where you want to go.

Invest in bilingual training courses like the one at the beginning of this column, and you will not only be investing in short-term improvements in productivity and profits, you'll also be investing in the long-term success of your vineyard and/or winery. ■

Jay Manriquez is an Associate with The Personnel Perspective, a human resources consulting, training and recruiting firm in Santa Rosa, CA. Jay has 23 years of management experience with a focus in human resources, quality, and organizational development. You can contact him at 707/576-7653.

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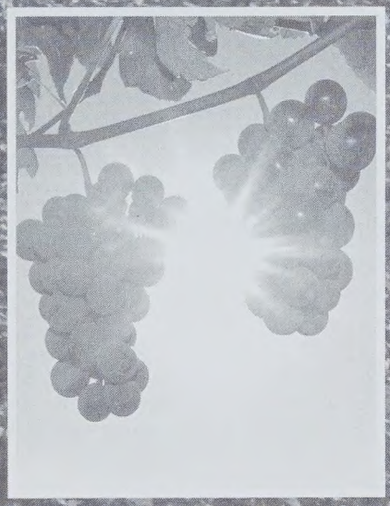

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